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COLD ROLLING MILLS

1. GENERAL DESCRIPTION OF ENGLISH PRACTICE IN COLD ROLLED PRODUCTS.

By ROLLINGER.

The object of cold rolling is to increase the normal mechanical properties of any material and to produce an accuracy in size which is not possible in hot rolled work. The general results given below give an approximation of the capabilities of cold rolling on steel, and these figures are also approximate for all other metals. They are taken from Dr. Thurston's treatise on iron and steel, and are the results of an extended investigation.

rolled iron turn abruptly and show a counter flexure in the curve just beyond the elastic limit.

(b) The diagrams of the annealed metal still retain characteristics of the unannealed.

(c) The result of cold rolling is the increase of the elastic limit nearly to the limit of strength observed at final rupture—and gives a smoother and more symmetrical curve than noted on diagrams of hot rolled metal.



VIEW IN AN ENGLISH BRASS ROLLING MILL.

The process of cold rolling increases

- (a) Tenacity from 25 to 40 per cent.
- (b) Resistance to transverse stress from 50 to 80 per cent.
- (c) Elastic limit under torsional, tensile and transverse stress from 80 to 125 per cent.
- (d) Elastic resilience from 300 to 400 per cent.
- (e) Elastic resilience in transverse stress from 150 to 425 per cent.

The remarks of Dr. Thurston on the autographic strain diagrams are also of much interest—he concludes that:

(a) The curves exhibit the same peculiarities as when testing by transverse stress and by tension. The diagrams of cold rolled iron after the elastic limit is passed, gradually fall into a horizontal line—while those of hot

The results of several hundred tests are given below:

	HOT ROLLED.	COLD ROLLED.
Modulus of		
Elasticity	25,000,000	26,000,000, as per sq. in.
Tenacity	52,000	70,000 pounds.
Elastic limit	30,000	60,000
Extension	25%	10½%

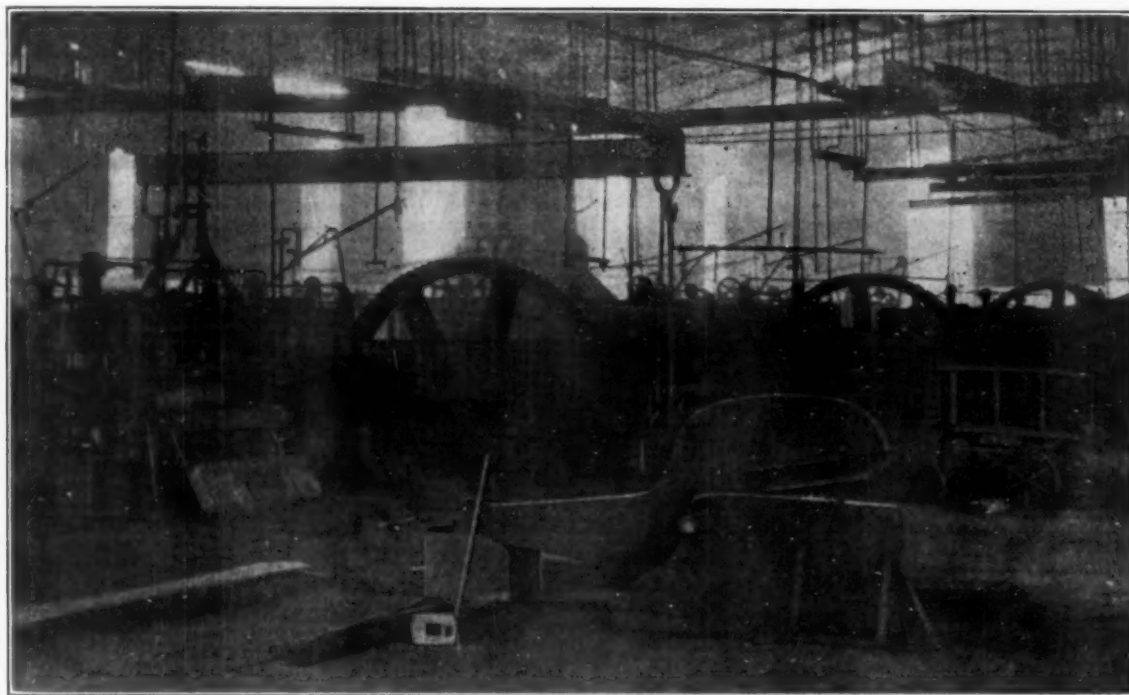
From the above mentioned results, it will be seen that a very greatly increased value is given to any material, but with the corresponding decrease in ductility; the material, however, is more reliable, because it is uniform throughout in strength. There are, of course, a number of materials, which will not withstand the operation of cold rolling, i. e., the very hard steels and iron—generally,

however, the process is adapted for steel, soft iron, brass, copper, bronze, german silver, zinc, silver, gold, platinum, tin, aluminum, lead, etc., and on all these materials, the mechanical properties are augmented, much in the same way as indicated in the table, and remarks above given for a soft iron. The operation of cold rolling is a slower one than hot rolling, the production being very much less, owing to the necessary slower speed at which the rolls run, and the smaller reduction which the materials will stand, but the upkeep of the plant is very much smaller.

Section rolling is increasing very much for cold work on certain materials, such as turbine blading, commutator sections, and on a large number of non-ferrous materials, which are not capable of being rolled hot, such as the better class of brass for wire, which is now being rolled in long lengths reduced down to $\frac{1}{4}$ in. from a 2-in. square billet. Fancy wires for mouldings, etc., are of course,

olution in the design and production of cold rolling mills. Again these demands also necessitate auxiliary machines, increasing in number and scope, such as shearing machines, straightening machines, polishing machines, edging rolls, coilers, spooling apparatus, etc., all of which have to deal with more and more accurate work, calling for special attention to the design. Another recent application in cold rolling is the production of foil in so-called continuous lengths, that is in very long lengths coiled in one length, so that a coil can be fixed on a swift and cut off, in some cases automatically in required lengths; this being a very considerable advance over the sheets in which foil was produced. This work required extreme accuracy and care in operation, as also the plant requires to be of the highest grade.

At the recent exhibition of non-ferrous metals held in London, there were shown a number of examples of foil in various thicknesses, and in so-called continuous



ANOTHER VIEW OF AN ENGLISH BRASS SHEET MILL.

rolled on design rolls, and this practice has advanced rapidly during recent years.

Small steel and metal strips are now rolled or flattened from wire; this has been a standard practice with some manufacturers for many years, but has very rapidly advanced in recent years as a general practice. Wires up to $\frac{3}{4}$ in. dia. are now flattened into strips up to $1\frac{1}{2}$ in. wide with round or square edges. The rapidity of reduction is greater than is possible by rolling sheets and slitting, and the continuous length is very much greater—lengths equal to 1 cwt. or even 2 cwt., are easily obtained, and this is of considerable moment for some operations, such as continuous press work, and special weaving patterns.

The production of accurately rolled material in the finer gauges has made very great strides during the past ten years, and has led to the introduction of more accurately made rolling mills than past requirements demanded. Many recent improvements have been tried with a view to producing strips of accurate and regular thickness, several of which will be described later. There is little doubt in the writer's mind that the day of the rough type of mill is coming to a close, and that the ever increasing demands for accuracy are necessitating a rev-

lengths. The standard stock sizes of tin foil are as follows:

No. 05—about	12 sq. ft. or	1,800 sq. in. to a lb.
No. 4—	20	2,880
No. 5—	25	3,600
No. 6—	30	4,320
No. 8—	40	5,760
No. 10—	50	7,200
No. 12—	60	8,640
No. 15—	75	10,800
No. 18—	90	12,960
No. 20—	100	14,400

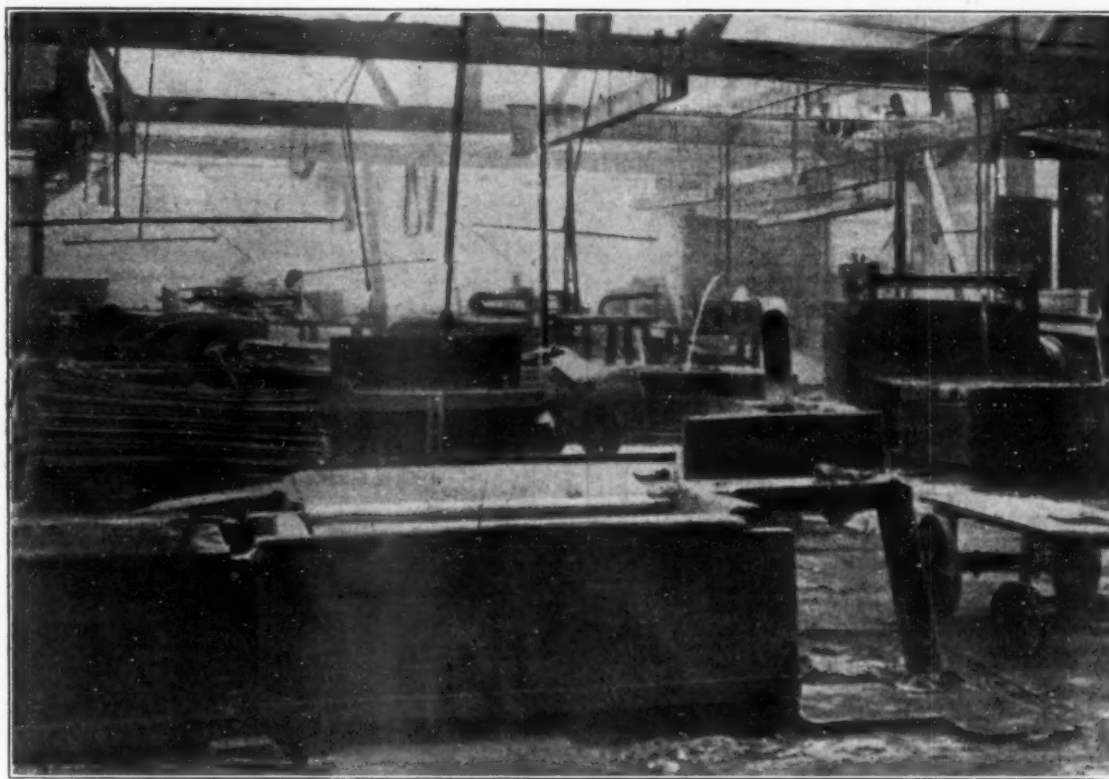
Generally any width from 1 in. to 12 in. is supplied and in lengths up to 300 ft., no general success has been obtained in the production of aluminum foils, but lead and alloys can be produced with ease. Cold rolled strip of the majority of metals can now be produced in far greater lengths than was possible a few years ago. In fact the tendency in all strip work is towards long lengths, and this is due to the call of automatic machines used in working up the strip into articles of various kinds; the longer the strip is the longer will the machine produce work without being reset. In Japan, for instance, up to the

present, it is impossible to obtain brass strip in longer lengths than 6/8 feet, but a plant is just installed to produce lengths up to 600 feet. The saving is obvious in such a case, where the strip is used for producing electrical fittings, one setting with the longer lengths, will now replace 100, as on the old method, using only 6 feet lengths. As requirements have increased in length, so straightness, color, accuracy as regards width and thickness, sharp edges, etc., have likewise increased.

Straightness needs accurate rolls and rolling together with efficient coiling apparatus, accuracy in width requires either edging rolls, as auxiliary to the main rolls, or accurately set shears to shear the strip parallel, and with sharp edges that is without leaving a fray or cutting at an angle—which results are now easily obtained with the machines which have been designed to obtain the necessary results. The question of color on non-ferrous strip, is one of annealing, which is rapidly receiving the

so many and varied sizes are required to be dealt with by the same mill. The ideal plant would be such that a certain product being dealt with, the various reductions could be standardized on certain mills, so that once being set, the rolls (except for those times during which the rolls were being trued up) would not be required to be touched and a continuous output of the same sized material could thus be produced. Such an arrangement would then lend itself to the continual improvements, which would present themselves from time to time, until the highest degree of efficiency was obtained.

Unfortunately, however, the continual changing of rolls, such as is necessary for a varied production, does not lend itself to continued improvement, because more often than not a certain speed may be necessary for one particular class of work, which is perhaps only occasionally dealt with—thus the increased speed, which other work might stand, has to be sacrificed—and loss of effi-



VIEW OF SHEARING AND PICKLING DEPARTMENT IN AN ENGLISH BRASS MILL.

attention it deserves, much of the questionable work in past years is easily traceable to faulty annealing; but one is pleased to notice the rapid spread in the use of pyrometric apparatus, and the employment of non-oxidizing furnaces and automatic quenching methods. No doubt can be expressed as to the very great advantages obtained by careful annealing, both in regard to the uniform temper resulting after rolling, and also to the greater range of reduction possible on a well annealed material. The most successful non-oxidizing furnace is that known as Bates and Peard patent furnace, which consists of a tube through which the material is passed by means of a chain, heated on the outside.

This tube being sealed by water at each end, prevents the introduction of air to the material being annealed. This system of annealing has been in use successfully for some years. Recently the Vaughan Hughes patent furnace has been evolved, which has many points specially designed for producing clean annealed materials; the details of the design of these furnaces is given later. The layout of cold rolling mills is at once an interesting and difficult study, more especially in this country, where

ciency results. This is doubtless a very unfortunate state of affairs, but it is one which has to be faced, and the plant arranged accordingly. This can often, however, be dealt with by having a special independent mill, to deal with special work, leaving the main plant, free to deal with the standard work; a separately driven mill arranged with a direct connected variable speed motor, will give a wide range for varied work, and although perhaps inoperative for some considerable part of its life, is only costing the interest of the capital expended, but when at work, it relieves the main plant of very unprofitable work. Providing, then, that a standard product is being dealt with, it merely becomes a question of providing the hot rolled strip of such a size and quality that may be required, and to fix upon the necessary number of reductions required to give the size and temper of the product. (To be continued.)

ALUMINUM CONSUMPTION.

More than 65,000,000 pounds of aluminum were consumed in various industries in the United States last year, a new high record.

CARBONATES IN SILVER SOLUTION

A STORY OF AN INTERESTING PHENOMENON IN WHICH TEMPERATURE PLAYED AN IMPORTANT PART.

BY GEORGE B. HOGABOOM.

There are so many interesting problems in the plating room that the plater is afforded an excellent field for the study of some of the phenomena of chemistry. Often something occurs in a plating solution which, if investigated, would prove to be both interesting and of much value. Many perplexing problems are solved without realizing it, at first, when a little time and patience is given to the study of seemingly uncontrollable conditions. This was found to be true in the crystallization of carbonates in the silver solution.

The presence and accumulation of inert salts in all plating solutions is well known, but how to remove them without a great expense is another story. They retard the flow of the current, rapidly age the solution and materially decrease the efficiency. Sometimes these salts are added to the solution to increase the conductivity, but the plater, unless he is also a chemist, will unknowingly increase the content beyond the proper limit, thinking that what has been added has been decomposed. They are also added with other salts which contain them as impurities. The action of the current and the effect of the atmosphere will also produce them. It is to the latter

deposition of silver it was decided not to remove the crystals, but to warm the solution to redissolve them and note the effects of their presence. From the first week in January until the last week in June the amount of silver deposited, the cyanide added (cyanide mixture 98-99 per cent), the approximate rate of deposition and the amount of pressure used was recorded. There being no means at hand to measure exactly the surface of the cathode, the number of amperes used were not taken. Neither was the resistance of the bath considered as no accurate instruments of measurement were available. The rate of deposition was obtained by weighing. It may be well to state that the solution used was for silver-deposit work, containing six ounces of metal per gallon and about



FIG. 1. POTASSIUM CARBONATE CRYSTALS IN A SILVER PLATING TANK.

action—the effect of the carbon dioxide of the air—that the presence of carbonates in a silver solution is attributed, and to this phenomenon we are indebted for the accompanying illustrations. So that there will be a better understanding, the whole story will be given rather than a recital of the mere facts brought out. The method followed and the results obtained are not given as accurate, and they may not be obtained from every plating solution, or even, every silver solution. Discussion and criticism is most earnestly invited, as something of value may finally result.

The question is—What effect has an excess of carbonates on a plating bath and can they be removed by crystallization?

The story: Upon resuming work after the holiday shut-down of 1911-12, a large number of crystals were noticed on the sides of a tank containing a silver solution, just below the surface of the solution. The crystals were colorless, with smooth glasslike facets and looked like pieces of crystallized quartz. Upon analysis they were found to be carbonates of sodium and potassium, with a small amount of silver—92 per cent. carbonates and .6 per cent. silver.

Not knowing the exact effect of carbonates upon the



A SILVER ANODE THAT WAS COVERED WITH POTASSIUM CARBONATE CRYSTALS.

five and one-half ounces of free cyanide. The solution was analyzed each week so that the free cyanide and metal content were kept as nearly constant as possible. The work was run for 22 hours; storage batteries being the source of electricity. To obtain what was considered a good deposit, in regard to weight and structure, 1.3 volts were needed.

At the end of the trial it was found that three and one-half ounces of metal had been deposited for each ounce of the cyanide mixture used. The metal content was kept constant by the anode, no metallic salt being added. During this period, especially on cold nights, there being no heat in the room at night, the solution acted very erratic. The deposit would be coarse and quite crystalline, and did not take the usual high luster when polished. If the content of the solution was not known, the temp-

tation to doctor the solution would have been irresistible. When the warm weather came the action of the solution became normal and the presence of the carbonates had no effect upon the structure of the deposit.

Knowing that the carbonates had been crystallized out in cold weather it was decided to see just what effect a lower temperature would have on the solution, so during the holiday period of 1912-13 the experiment was made. The windows of the plating room were kept open during a very obliging three-day cold spell, and the temperature of the solution was lowered to 36 degs. F. The desired effect was obtained, and when the solution was removed from the tank a very surprising amount of crystals were revealed (Figure No. 1). The tank contained 100 gal-

only one volt pressure was needed to obtain the same weight of deposit in the given time, as used in the previous test.

The anode in illustration No. 2 was entirely covered with crystals showing how, often, during the first trial the whole tank of anodes would look after a cold night. The anode in Fig. No. 3 illustrates the effect of the presence of a large amount of carbonates on the reduction of the metal. At first it was thought that the refiner was to blame and that the anode was not perfect. Some of the anodes were saved and run in the solution during the second trial, and they reduced very good, as shown in Fig. No. 4.

As was stated, these results were not obtained from a scientifically conducted investigation, but rather from inquisitiveness. They were surprising, and saved much expense, and put the solution in a condition almost as good as if a new one had been made. It is hoped that not only will this experiment prove interesting, but that it will be the means of starting some research work along the line that is suggested. The successful removal of inert salts through a simple, inexpensive method would do much toward making the burdens of the plater lighter. It would add to the longevity of a bath and aid in obtaining a more uniform deposit.

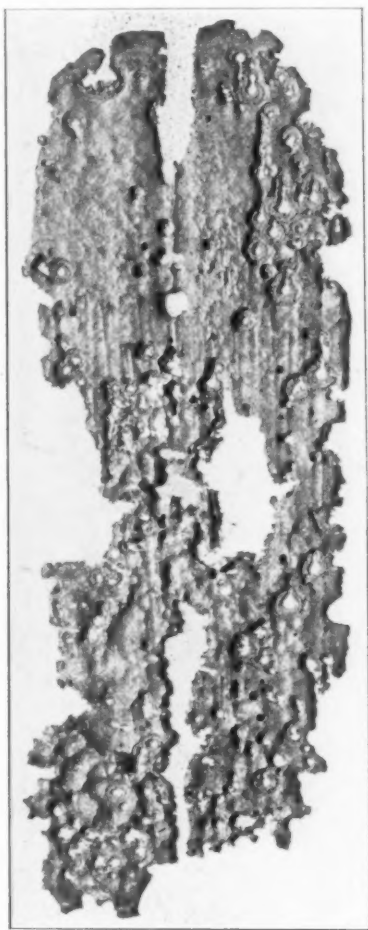


FIG. 3. EFFECT ON SILVER ANODE OF A LARGE AMOUNT OF CARBONATES.



FIG. 4. ANODE AFTER CARBONATES HAD BEEN REMOVED.

lons of solution, and when the crystals were removed and thoroughly drained, they weighed 75 pounds, showing $\frac{3}{4}$ of a pound had been precipitated from each gallon of solution. The specific gravity of the solution was lowered six points on the Baumé scale, from 26 degs. to 20 degs. As previously, the carbonate content of the crystals was about 92 per cent., while the silver this time was .7 per cent.

A similar test was made for silver deposited, cyanide used and pressure employed for another period of six months, of the same months of the year as before. This time the action of the solution was far more uniform, and little or no trouble was experienced. Seven ounces of metal was deposited to each ounce of cyanide added and

metal. This metal is reported to be a steel composition whose make-up is at present secret, but that the metal is extremely light and has great tensile strength. In few of these facts it is safe to hazard a guess that the metal in question is not a steel composition but an aluminum alloy of the nature of magnalium or duralumin. It is claimed with the employment of this metal that the weight of a sledge can be reduced sixty pounds, and this means a saving of six hundred pounds weight on the ice, or twenty days' food for an ice party.

JAPANESE COPPER.

Japan exports to the United States annually copper to the approximate value of \$3,000,000.

THE MELTING POINTS OF FIRE BRICK.

According to the United States Bureau of Standards, the melting points of fire bricks are as follows: The most common fire brick, or those made of clay, of which the main ingredient is kaolin, will melt at a temperature ranging from 2,831 to 3,137 degs. F.; bauxite brick, from 2,949 to 3,245 degs.; silica brick, from 3,092 to 3,101 degs.; chromite brick, at 3,722 degs., and magnesia brick, at 4,929 degs. These melting points, which represent the lowest temperature at which a small piece of the brick could be distinctly seen to flow, were determined in an electric vacuum furnace, the temperature being measured with an optical pyrometer.—Popular Mechanics.

METAL SLEDGES AT THE SOUTH POLE.

The dispatches in the daily press report that Sir Ernest Shackleton is going to use a new sledge in his next trip to the South Pole, which will be constructed entirely of

RUST-PROOFING IRON AND STEEL ARTICLES

A REVIEW OF THE VARIOUS PROCESSES, OLD AND NEW, FOR PRODUCING A BLACK FINISH.

By EMMANUEL L. BLASSETT, JR.

One of the greatest metallurgical problems of the day has been to produce a non-corrosive surface on iron and steel by chemical or electrochemical methods. The application of enamel, japan, paint, varnish and bronze powders to iron and steel surfaces, to prevent corrosion, is widely practiced. It seems to solve the problem for certain articles, and a description of these methods does not come within the scope of this paper. The real modern problem has been to produce a rust-proof finish that would not obliterate or obscure the minutest outline of the article treated. Furthermore, the ideal process should not destroy the physical properties of the metal, such as its temper and resilience. That the finish should be dark or black in color has also been found desirable in many instances. Nickel has for many years been used as a decorative and non-corrosive coating for iron and steel, but has not proved efficacious or durable enough in this respect. All electro-deposits are apt to wear through in a short time on the edges of plated goods, and when this happens, oxidation rapidly takes place and the rust becoming lodged underneath the deposit soon forces it off. This would not be the case with a finish produced by the latest Bower-Barff process, or by Coslettizing, for the reason that the surface of the metal treated is converted to the black oxide of iron or phosphate of iron. Hot galvanizing has long proved to be a very good protection against corrosion, but its application is very limited owing to its poor appearance and the impossibility of using the process for many articles in ordinary use.

Within the last decade many skilled chemists and metallurgists have sought to discover a chemical or electrochemical process that would protect iron and steel from corrosion, with the result that several new methods have come into industrial use. The processes now in use consist in converting the surface of the article treated to the black oxide of iron, or the phosphate of iron. Further experimenting may result in discovering other iron compounds that may prove equally rust-proof.

BLACK OXIDE OF IRON.

The production of the black oxide of iron (Fe_3O_4) on the surface of iron and steel, to prevent corrosion, has been practiced for many years and is the oldest of the purely chemical methods. The fact that iron became coated with the black oxide when treated with superheated steam was undoubtedly noticed at an early date. Prof. Barff was the first to seek to apply the principle industrially, but it has remained for later investigators to perfect the methods of producing the black oxide so that it may be used extensively as a commercial finish. There are three processes for producing the black oxide in use at the present time known as the Bradley rust-proofing process, the Bontempi process and the cold process, the latter being used especially on edge tools. When the surface of iron and steel has been converted to the black oxide, corrosion ceases, as no more oxygen can be taken up by the iron. For this reason it forms an ideal rust-proof coating for the underlying metal.

All processes, based upon the use of excessive heat, for producing the black oxide of iron must necessarily have a limited application. Such methods, for instance, cannot be used for finishing edge tools, as the temper would be destroyed. Articles are also enlarged by heating, and measuring instruments and work of delicate design or figures cannot be treated. The black produced by excessive heat is also considered too heavy for some

articles, as too great amount of the surface is converted to the black oxide. For edge tools, measuring instruments and articles of delicate design the cold process for producing the black oxide should be used.

BOWER-BARFF PROCESS.

The original process for producing the black oxide of iron by heating the surface of iron to a red heat dates from the year 1876. In that year Frederick S. Barff was granted a patent in England for an "Improvement in Processes for Protecting Iron Surfaces." The original methods employed by Barff and his immediate successors have been greatly improved upon, and a brief historical survey of this process will prove interesting. In the Barff process the articles to be treated were heated to a red heat in a closed vessel, followed by the injection of superheated steam. In the year 1880 George and Anthony S. Bower were granted a patent in England and the United States on a method for "Coating Iron with Oxide." This method consisted of heating the article to be treated in an atmosphere of carbon dioxide, instead of steam. This process was based on the well known chemical fact that when iron is heated to a red heat with carbon dioxide it will reduce the carbon dioxide to carbon mon-oxide, and the iron itself is converted to the black oxide. Much difficulty was encountered in using both of these methods, and the oxide was apt to scale off and be without uniformity. Several improvements made by Geo. W. Gesner, of Brooklyn, in the year 1888 was the next step in the development of this interesting process. Gesner's modification consisted in introducing an hydrocarbon, such as naphtha, with the steam. The black oxide produced by the Gesner method contained hydrogen, which rendered it less liable to scale. Gesner also improved the furnace for producing this finish. All these early methods had one great disadvantage in industrial operation. Uniformity was not always possible and the red oxide, or ordinary iron rust, was frequently formed simultaneously with the black oxide. The latest improvement in this process was made in the year 1908 by John J. Bradley, of Brooklyn, and is known as the

BRADLEY RUST-PROOFING PROCESS.*

The improved process introduced by Mr. Bradley was patented by him in 1908. By his method a more durable and uniform finish is produced, and what is of still more importance, the red oxide is not formed. It is interesting to note that Mr. Bradley collaborated with Gesner, while the latter was conducting his experiments in producing this finish. By the Bradley process the articles are heated to a red heat in a muffle and hydrogen gas is then introduced. Gasolene in small quantities is also passed in in order to improve the color of the coating. The ordinary muffle furnace is operated and coke is used for fuel. To produce an even finish the article to be treated is first cleaned by tumbling, pickling or sand blasting. Sand blasting is preferred, as it leaves the surface of the article in a more suitable condition for producing the finish. The articles are left in the furnace for an hour or until a sufficiently heavy coating of the black oxide is produced. They are then taken out and allowed to cool and finally oiled with linseed or paraffine oil. The oiling improves the color for decorative purposes. Steel, malleable iron or cast iron may be treated by this method,

*THE METAL INDUSTRY, January, 1912.

and the coating produced is very impervious to the action of the atmosphere.

THE BONTEMPI PROCESS.

The Bontempi rust-proofing process, patented a few years ago, may also be considered as a modification or improvement on the original Bower-Barff process. The Bontempi process consists in heating the article as in the Bradley process and then passing in steam and the fumes of zinc or some heavy hydrocarbon, such as tar or pitch. A very heavy oxide is produced depending upon the length of time the article is treated. The finish is invariably uniform and of a deep black color. It is claimed to withstand corrosion for an indefinite time. Augusto Bontempi, of the Bontempi Company,* has recently improved the process and obtained a patent for the use of various substances, claimed to accelerate the formation of the black oxide. As in the Bradley process, a muffle furnace is employed and the articles are heated to 900° F. or more.

COLD PROCESS FOR PRODUCING THE BLACK OXIDE.

The cold process for producing the black oxide of iron can be used with facility on a large variety of goods. It is especially adapted for refinishing edge tools and general hardware. Although it is used extensively at the present time, it is most likely to be discarded for more simpler and economical methods, and "coslettizing" or some such process may supplant it. There seems to be no record of the origin of this process, but it is known to have been used for many years, especially for finishing gun barrels. The black oxide produced by the cold process is much lighter than that produced by heating in a furnace and is not considered so highly resistant to the corrosive action of the atmosphere. The cold process produces a smooth and full black coating, which does not scale off and is considered sufficiently rust-proof for a large variety of goods.

The process has been described by "Ionic" in THE METAL INDUSTRY for October, 1910, and only a brief description of the process will be given here. The article should be cleaned as if for plating, after which it is coated over with a solution composed as follows:

Water	4 ounces.
Alcohol	4 ounces.
Ferric chloride	½ ounce.

The solution is applied with a sponge to the article to be treated; care should be taken that the sponge is well squeezed out before applying it to the work. Too much solution on the sponge will not produce the desired results. The articles are then placed in a warm, moist atmosphere. For this purpose a chamber heated by steam is employed and the exhaust from the steam coil produces the necessary moisture. The articles are steamed for 45 minutes, when they are removed from the chamber and immersed in clean, boiling water for 15 minutes. After removing from the water bath and cooled, the work is scratch-brushed on a fine wire-wheel brush revolving at about 600 revolutions per minute. To obtain a good and durable black oxide, it is necessary to sponge the work with the solution previously given two or three times, followed by steaming, hot water treatment and scratch brushing as in the first operation. After the final scratch brushing the articles are oiled with linseed oil and carefully wiped with a cloth. The oil should always be applied, as it improves and deepens the color and makes the work still more rust-proof. Anyone interested in this

process should obtain a copy of THE METAL INDUSTRY for October, 1910, wherein a complete and adequate description of the process is given.

There are several modifications of this process in which more complicated solutions are employed, but the results are not any better and are usually more expensive to operate, requiring more labor and attention. The following formula is said to be used extensively on Swiss watches and novelties made of steel and iron:

	Grammes.
Nitric acid.....	27.0
Hydrochloric acid.....	7.5
Copper sulphate.....	7.5
Ferric chloride.....	333.5
Water	2000.0

The articles are sponged as previously described and placed in a drying chamber heated to about 100° F. for 20 minutes. The work is then steamed in a separate compartment for a half hour or more and again dried in the drying chamber for 20 minutes, when the work should be coated with ordinary iron rust. The articles should then be immersed in clean, boiling water for 20 minutes, and after being allowed to cool are scratch brushed. These operations as in the process previously described are repeated three times, or until a suitable black is obtained. This process is said to be extensively used in Europe, but it seems to be more expensive in operation and the results are the same as in the cold process previously given.

OTHER METHODS FOR PRODUCING THE BLACK OXIDE.

There are various other methods for producing the black oxide of iron. It may be produced by immersing the iron or steel article in molten nitre (nitrate of potassium or saltpetre) or nitrate of sodium (chile saltpetre). This is known as steel bluing, and is used extensively on a large variety of articles. The color may be blue or black, depending upon the length of time the article is immersed and the degree of heat employed. Small articles, such as steel buttons and buckles, may be given a black finish by tumbling in a sheet iron barrel heated to the right temperature by means of a gas furnace. This is the usual method for finishing iron and steel novelty work requiring a black finish. Heating the articles in charcoal also produces a blue or black oxide, and the process is extensively used on revolvers and general hardware. These methods, however, do not produce a finish that can be considered rust-proof. The oxide formed is too light and corrosion is not retarded to any great extent.

COSLETTIZING.

The method known as Coslettizing is very simple and economical to operate and may be regarded as the most advanced step in rust-proofing iron and steel. It is the ideal process for general work. Coslettizing consists of producing upon the iron or steel article a coating of phosphate of iron (Fe_3PO_4), which is quite impervious to the action of the atmosphere. This process was discovered by Thos. W. Coslett, an analytical chemist of Birmingham, England. The process was patented in England in 1906 and in the United States in the following year. The process was described by the writer in THE METAL INDUSTRY for May, 1911, and its extensive application since that time merits further attention. It is now extensively used on typewriter parts, harness trimmings and general hardware. There is a very wide field for the application of this process, and articles of the most delicate nature may be treated without injury. This method does not destroy the physical properties of the

*Bontempi Rust Proof Company, Bridgeport, Conn. THE METAL INDUSTRY, May, 1912.

metal treated, and articles are not perceptibly enlarged as in the heat process. Such articles as watch springs and micrometers have been successfully treated by this method.

The solution for Coslettizing is made as follows:

Concentrated phosphoric acid..... $\frac{1}{2}$ gal.
Water $\frac{1}{2}$ gal.
Iron fillings..... 2 lbs.

When the iron is thoroughly dissolved, this solution is added to 50 gallons of water. A wrought iron tank is necessary to hold the solution, which should be heated close to the boiling point by a gas stove or a steam coil. If desired, the tank may be encased in brick work and wood or coal may be employed as fuel.

The work to be treated by this method is first cleaned as if for plating. If necessary it should be pickled in the usual muriatic dip to remove the rust. The work is suspended in the solution by means of iron wire or hooks; small articles, such as screws or bolts, are placed in iron or earthenware baskets. The solution must be kept close to the boiling point, and the work is allowed to remain in it from one-half hour to three hours, depending upon the nature of the work or the thickness of the coating required. This process produces the most rust-resisting finish for iron and steel by simple immersion in solution that has yet been discovered. A very slight amount of the surface of the article treated is converted to the phosphate of iron, but most of the coating comes from the solution itself. When the solution is working properly, a heavy coating is produced in two or three hours. A convenient arrangement for a small bath is to make up the solution in an enamel or agateware tank and heated by placing it in boiling water. A wooden tank may be used for holding the water, which should be kept hot by a steam coil.

When the work is removed from the solution it should be allowed to dry in the air; rinsing in hot water is unnecessary. If the work treated is to be used for ornamental purposes it should be scratch brushed on a fine wire wheel brush revolving about 600 revolutions per minute. The finish is much improved by oiling with linseed or paraffine oil.

The licensees of this process are given a chemical test worked out by the inventor, which indicates the condition of the solution and the proper density to maintain it. The manufacturers who are using this process speak very highly of it. Typewriter manufacturers use it on work that is finally japanned and claim that it retards corrosion to a remarkable degree on typewriters used in torrid climates or on vessels. If the body of the typewriter is not Coslettized, the rust eats through the japan much sooner. The inventor of this process has recently patented a new formula for Coslettizing, which contains zinc and is made up as follows:

Zinc 6 ounces
Phosphoric acid..... 1 pint
Water 1 pint

This is the "stock" solution which should be used in portions of 1 ounce to each gallon of water. An interesting modification of this process was recently patented by F. R. G. Richards, of Coventry, England. The formula is as follows:

Water 1 gallon
Manganese dioxide..... 3 pounds
Phosphoric acid..... $\frac{1}{2}$ pound

The English courts declared this formula an infringement on Mr. Coslett's process, and the patentee is barred from introducing it. Coslettizing has now become a

firmly established industry, and in the future it will be used extensively on general hardware.

ELECTROCHEMICAL METHODS FOR RUST-PROOFING.

Electrogalvanizing is unquestionably the most durable and practical rust-proof finish that can be produced by electrodeposition. The work to be rust-proof should be given a heavy deposit so that it may not be readily worn off by friction. The solution usually employed is composed as follows:

Zinc sulphate..... 2 pounds
Aluminum sulphate..... 2 ounces
Water 1 gallon

A good heavy deposit of brass, copper or nickel on steel and iron retards corrosion for a considerable time and these methods are too well known to describe here. Black nickeling seems to be the only method for producing a black finish directly on iron and steel by deposition that is fairly rust-proof. To produce a black nickel deposit the following formula is generally used:

Double sulphate of nickel and ammonium.... 10 ounces
Zinc sulphate 1 ounce
Sulphur cyanide of potash..... 2 ounces

Black nickel deposits should be lacquered or oiled to still further retard corrosion or prevent staining.

Another method that produces a black finish on iron and steel by the use of the electric current is as follows:

Lead nitrate..... 12 ounces
Ammonium nitrate..... 8 ounces
Water 1 gallon

The articles to be colored are hung on the positive or anode rod. For a cathode, sheet steel may be used. This solution merely colors the work treated and the finish should be oiled or lacquered when it will keep from rusting for a certain time. The rust-proofing of iron and steel articles by chemical or electrochemical methods is still capable of further development, and the future, no doubt, will see new processes come into industrial use.

TO GIVE ALUMINUM THE APPEARANCE OF MATTE SILVER.

The frame-makers have commenced to use aluminum to a great extent instead of gold or silver leaf; even frames out of aluminum sheet are made. But the color of these latter is not exactly that which suits the average purchaser; so a process has been discovered which gives them the appearance of matt silver. This consists in dipping the articles in a bath composed of 750 grams of clear water and 80 to 97 per cent. caustic soda. (This latter dissolves but slowly.) Small frames are laid in this with the face up, and allowed to remain there until the bath is tolerably full of gas. Care must be taken that no undissolved soda lies on the bottom of the bath. The frames are then rinsed well with pure water. If there are any specially deep places in the frames, they must be carefully rinsed out, so that no soda solution remains in the cavity. The character of the silver coating will be determined by the length of time that the articles remain in the bath. If it be desired to silver only the face of large articles, they may be well brushed over and over again with the solution of soda; but care must be taken that the parts are quickly brushed, else the color will be unequal.—ROBERT GRIMSHAW.

ENGLISH MACHINE TOOL EXPORTS.

Machine tools exported from the United Kingdom during the first ten months of 1913 had a total value of \$3,952,000—increases of \$327,000 and \$1,013,000 over like periods in 1912 and 1911.

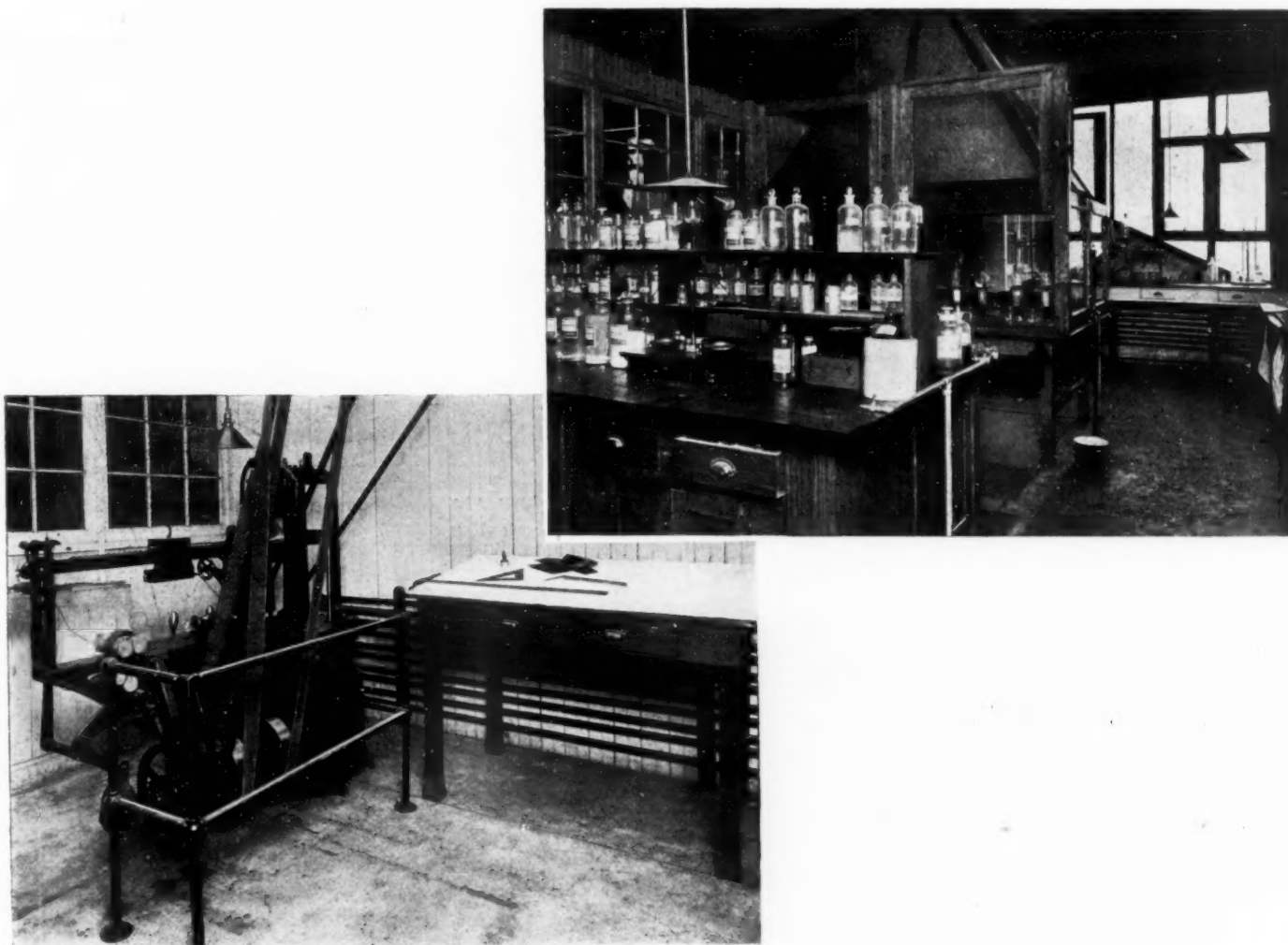
PROGRESS IN THE MANUFACTURE OF STANDARD ALLOYS

A BRIEF DESCRIPTION OF THE ENLARGEMENT OF THE PLANT OF THE LUMEN BEARING COMPANY, BUFFALO, N. Y.

By LUMEN.

The history of the Lumen Bearing Company furnishes an unusual example of the success that may be attained through careful management and good direction of organization, even in brass founding—a business filled with uncontrollable features in purchases and most susceptible to blundering competition in sales. Starting some twelve years ago, taking over the affairs and small foundry of

of the non-ferrous casting business, the organization grew rapidly and soon demanded a chemical laboratory, a testing machine, and the application of the most modern ideas of scientific management. An order system, worked out to the smallest detail; a comprehensive cost system; the daily control of metals; and all the details of melting, molding, coremaking, cleaning, inspecting and shipping were carefully studied. Unnecessary data and



FIGS. 1 AND 2. VIEWS OF THE LABORATORY OF THE LUMEN BEARING COMPANY, BUFFALO, N. Y.

the defunct predecessor, the present company began the manufacture and sale of Lumen bronze, the zinc base alloy so well known today among electric-motor and machine tool builders.

The capacity at that time, mainly Lumen, was about \$100,000 annually. With the plant enlarged to the present capacity, the annual capacity today is about \$2,000,000, an increase of 2,000 per cent. (Copper in 1901 averaged about 17 cents, tin about 27 cents, comparing today with 15 cent copper and 40 cent tin.)

The Lumen bronze attracted a great deal of favorable attention and brought inquiries for the copper-tin bronzes and various grades of brass. Entering into all branches

details were dropped, to the betterment of efficiency and of service, and a "balance" of organization arrived at that makes it most readily possible to undertake each new cast-problem effectively—the most vital feature of a successful jobbing brass foundry.

The sales department is strong and active, its men being trained to work out bearing problems with the customer, with the aid of a capable engineer at Buffalo. The Lumen Bearing Company's booklets, and monthly metal reports are instructive and aim to extend broadcast interesting data about the non-ferrous alloys. These books are written by members of the organization, many of whom are graduate engineers.

The following table indicates the capacity of the plant in area, molding and melting:

Department.	Size.	Area.
Molding floor.....	55 x 189	10,395 sq. ft.
Al molding floor.....	29 x 49	1,421 sq. ft.
Total molding floor.....		11,816 sq. ft.
Babbitt room.....	34 x 81	2,754 sq. ft.
Cleaning room.....	34 x 75	2,550 sq. ft.
Inspection room.....	32 x 32	1,024 sq. ft.
Shipping room.....	32 x 50	1,600 sq. ft.
Patt. shop.....	30 x 30	1,500 sq. ft.
Patt. storage.....	24 x 91	2,184 sq. ft.
Melting room.....	35 x 77	2,695 sq. ft.
Core room (oven included).....	41 x 65	2,665 sq. ft.
Core room capacity—		
14 core makers		
5 machines		
Core room oven shelf area.....		430 sq. ft.
Storeroom.....	39 x 53	2,067 sq. ft.

and brass trolley wheels, or for die castings. Figs. 1 and 2 are views of the laboratory and Fig. 3 shows a view taken in the main foundry. The overhead trolley system, overhead cranes, oil and coke furnaces, molding machines and other items indicate the flexibility so necessary to satisfy all demands.

In addition to Lumen bronze the company has made a specialty of manganese bronze and has recently issued a special booklet entitled "High Tensile Bronze," covering this well known metal. Continual attention to detail is absolutely necessary in the manufacture of this metal, if a high strength, high grade material is to result.

A new booklet is in press, to be known as "Bronze Alloys," which will enumerate the most important metals giving physical properties, hardness, etc.

The company operates a branch plant at Toronto, Ontario, where the same plan of operation prevails as at Buffalo. The Toronto plant is the Buffalo plant on a



FIG. 3. SHOWING THE MOLDING MACHINES IN THE MAIN FOUNDRY OF THE LUMEN BEARING COMPANY, BUFFALO, N. Y.

Machine shop.....	28 x 130	3,640 sq. ft.
Carpenter shop.....	35 x 43	1,505 sq. ft.
Total.....		36,000 sq. ft.
Moulders (machines, benches and floor).....		60 sq. ft.
Furnace capacity per day—		
Oil.....	23,000 lbs.	
Coke.....	18,000 lbs.	
Aluminum.....	3,000 lbs.	
Babbitt.....	25,000 lbs.	
		69,000 lbs.

This table does not indicate the capacity for bronze

smaller scale, making non-ferrous castings, trolley wheels, die castings and babbitts.

GERMAN COPPER CONSUMPTION.

L. Vogelstein & Co., agents for Aron Hirsch & Sohn, Halberstadt, Germany, report the German consumption of foreign copper from January to October, 1913, 185,381 tons, derived from imports of 193,457 tons and exports of 8,076 tons. Consumption for the same period in 1912 of 169,551 tons. Of the total imported 167,015 tons were from the United States.

PROGRESS IN THE ELECTRO-DEPOSITION OF METALS

A REVIEW OF THE OLD AND NEW SALT COMPOSITIONS FOR USE IN ELECTRO-PLATING.

By CHARLES H. PROCTOR.

In reviewing the art of electro-plating in 1911 the writer stated that any advance made in the chemical development of the solutions would have to be based upon higher concentration, due to greater metallic content of the baths, if any important advance was to be expected in the rate of deposit over previous methods in use.

It is well understood by the majority of platers at the present time who have given any thought to the problem at all that one ampere flowing for one hour through a given solution will deposit a certain amount of metal according to its specific gravity and its electro chemical equivalent. So if, for example, we are doing a certain class of work that requires, say, fifty amperes to give a sufficient deposit in one hour and if we could prepare a solution of sufficiently high metallic content and could carry a hundred amperes the same deposit upon the same surface to be plated would be accomplished in one-half hour. Therefore, the output of a plating department with solutions of a high metallic concentration would be nearly doubled at a very low cost proportionately, or two tanks made up with higher density solutions would give a greater output than three under the older conditions.

The inventors of Prometheus, Persels and a number of other concentrated nickel salts no doubt had this object in view when experimenting to change the composition of the older formulae in use so many years, to meet the new order of things which spelled more rapid deposits at a proportionately lower cost for the output than was possible with baths of low concentration in previous use. How far the advantages of such salts have been carried out in practice must be left to those platers who are adopting the new order of things and are willing to speak out in defense of these new composite salts in preference to the older formulae so long in use. THE METAL INDUSTRY columns are always open for such friendly discussions that are unbiased opinions and will lead others to profit by the experience gained by them in the use of such salts.

Recently a question was asked thus, "What advantage is gained by the use of Prometheus nickel salts over Dr. Adams' nickel salts?" I would say that the answer to this question by the manufacturers would be, is that a deposit that required, say, one hour immersion in the double salt nickel solution could be obtained in one-third the time with the Prometheus solution. Mr. Plater, is this a fact? If you are using these salts you probably know whether this statement is true or not. One thing we do know, those of us who have not used these new salts and are still using the old formula referred to as the Adams' salts, that it is impossible to carry more than twelve ounces of double nickel salts per gallon and even this amount will, in the winter time, produce a solution of too high a concentration so that the salts will frequently crystallize out upon the anodes and require a further reduction in concentration to overcome this difficulty, so that the solution may not contain more than eight to ten ounces per gallon of the salts. Figure out the metallic content of double nickel salts based upon eight to ten ounces per gallon, then figure out the metallic content of single nickel salts based upon one and a half pounds per gallon. The double salts will give you approximately ten per cent. of metal and the single salt thirty-three per cent. of metal. This is the reason why the new salts give more rapid deposits, as they contain a higher metallic content and consequently a greater amperage can be carried upon a given cubic foot of surface.

In preparing the new solutions as high as two pounds or more of the salts are recommended per gallon, their composition being based upon the single nickel salts, magnesium and sodium salts to the exclusion of the ammonium salts. It is possible to obtain this high degree of concentration without difficulties of re-crystallization with the lower concentration of the ammonia nickel salts, such as the double nickel salts or compositions of a like nature. You can obtain some idea how it is possible to use such solutions of high density if you prepare a nickel solution based upon the use of one and a half pounds of dehydrated single nickel salts, eight ounces of magnesium sulphate and four ounces of chloride of sodium. While this may not give you a perfect working solution it will give you some idea regarding the high concentration possible with the new nickel salts.

A well-known nickel salt that has been upon the market for a number of years and gives excellent results as far as the deposit and color are concerned and consists of a mixture of the double nickel salts and chloride of sodium (common salt) twelve ounces per gallon, but this solution will not give a high rate of deposit, because the metallic content is low and it is not possible to increase the rate of concentration, owing to the difficulties that will develop as with the ordinary nickel salts at a low temperature. In alkaline solutions such as cyanide solutions the same idea regarding the higher metallic content aptly applies. If we desire to increase our output we must use solutions that will carry a higher amperage upon a given surface than is possible with the older formulae now in use.

A number of new salts have been placed upon the market within the past year or two for copper, brass and bronze plating. Many of these are mere mechanical mixtures combining a number of salts, in use at the present time, as one salt. It is possible to obtain very good results with such salts, especially in preparing new baths, but where there is more than one salt in combination it would be difficult to maintain such solutions constantly producing a uniform color and a homogeneous deposit unless the conditions were ideal regarding the current, anode and cathode surface and the same rate of metallic reduction from the anode and decomposition of the cyanide and conducting salts were continuous. Unless this is possible the writer sees no advantage in such compositions as the addition of one or the other salt, such as copper or zinc, would have to be added unless, as stated, the conditions were so that the decomposition and metallic reduction were exactly the same day by day.

The very large manufacturers of silver plated ware in the eastern states have developed the most satisfactory conditions for rapidity of deposit and high metallic concentration. Such solutions frequently contain from six to eight ounces of metallic silver per gallon in the form of cyanide of silver. The free cyanogen content is carried out by either the addition of potassium or sodium cyanide. In several large plants, especially where steel knives are plated, the sodium cyanide is being used exclusively to a greater advantage than the potassium salt. A well-known supervisor of the plating department in one of these large plants informed the writer about a year or more ago, that by the use of sodium cyanide he was obtaining a greater reduction from the anodes at a propor-

tionately less cost than with the potassium salts.

The manufacturers of Trisalyt* realizing the advantages to be gained by baths of a higher metallic content are now placing upon the market cyanides of the metals upon a commercial scale. When we realize that only a short time ago cyanide of copper was quoted at two dollars per pound and at the present time can be purchased for one-fourth that price we can readily see the advantage in the use of the cyanides of the metals. Cyanide of copper contains seventy per cent. of metal and cyanide of silver eighty-two per cent. of metal. When free cyanide is developed in solutions these cyanides of the metals are the best additions to make to bring the bath back to normal conditions. Several well-known hardware concerns in the East several years ago adopted the method of only using cyanide of sodium and cyanide of the metals, and when in conversation with the foremen of these plants they stated that they had followed out the idea of the large silver plating concerns and believed they were getting as nearly good results as possible, having only a metallic salt and a cyanide to contend with.

The best bath in the writer's opinion for solutions of copper, brass, bronze and silver or gold would be

*Roessler & Hasslacher Chemical Company, New York.

those made up from Trisalyt or other salts of a similar composition and then maintained only by cyanide of sodium or potassium and cyanides of the metals.

Every new addition of salts that come upon the market is well worth considering, if the claims made for them can be substantiated in practice, then oftentimes it is a good deal of satisfaction to the plater to say, I have tried out the salts, and tell the story accordingly. Unfortunately too many claims are made for certain products. I have in mind one that is claimed will do away with the use of cyanide and yet a new bath cannot be prepared with the material in question. There is one thing that it is well to remember, and that is the active solvent for the anodes in alkaline solutions made up with cyanide is cyanogen. Whatever the composition of the material used it must contain this cyanogen.

Let us keep as near to the truth as possible, although we have no pure chemical laws that will guarantee to the plater that the material consists of certain guaranteed compositions and those only. Yet it is due to him as a consumer and to all legitimate manufacturers of chemicals or supplies in electro-plating to be able to guarantee that the article is as represented. The plater will then have faith in salesmen and a new era for the plating industry will commence in the year 1914.

EFFECT OF CRUCIBLE "SOAKING"

A PRACTICAL SUGGESTION FOR PROLONGING THE LIFE OF GRAPHITE CRUCIBLES.

BY JONATHAN BARTLEY.†

The subject of this article was suggested by a recent visit to one of the largest foundries in the West. The reason why the same crucible will give such varied results in different foundries is a question that has been asked hundreds of times, and has been answered in a general way by saying that different conditions existed.

This answer is substantially correct. The furnace, draft, fuel, tongs, annealing and method of handling all have a bearing on the life of a crucible, and when these differ to any great extent, it is only natural to expect different results. BUT where conditions are the same as far as appliance is concerned, same furnace, same fuel, same tongs, annealing and method of handling, why is it that this crucible will give an average of from 25 to 30 heats in one plant, and only 12 to 15 in another?

The foundry visited had a strictly up-to-date equipment and the greatest care was exercised with annealing and method of handling, yet the average was only 12 to 16 heats, and they had used every make of crucible. I had a very interesting talk with the superintendent, who by the way was a very intelligent man, and in the course of the conversation it developed that they were only taking off two heats a day.

The plant had twenty-four furnaces and the practice was to charge the crucible at the beginning of the day and pour about 11:30 A. M., re-charge and pour again about 4 o'clock P. M. Under favorable conditions with good draft, it should not take more than from one hour and a half to one hour and three-quarters to melt in a

No. 60 pot; therefore, this crucible, charged at 7:30 A. M. is ready to pour at 9 o'clock. From 9 o'clock to 11:30 it simply "soaks." In other words, it has received punishment sufficient for another melt, wasting its life without producing anything.

To get best results, a crucible of this size should make five pours a day. It is a noticeable fact that all of the rolling mills get an average life of from 25 to 30 heats out of their crucibles, and, in fact, I have on file in our office reports from the largest rolling mill in the United States, a record of an average of 36 heats. The reason for this lies in the fact that their practice is to make a pour just as soon as a melt is obtained. I realize that this is not always possible to do in all casting shops, but I believe from observation and experience that more careful attention given to this matter would prove a great saving in foundry expense.

Note the differences between a crucible that has run five heats a day and one that has only run two heats. Break them open after they have finished their life. In the one that has run five heats, you will find the walls thin, clean on the inside, and the broken wall will show a bright lustre like the graphite as it went into the

crucible. In the other, you will find that the wall is thick, thicker sometimes than it was at the start, the inside coated with a residue from the slow action of the flux, and when broken the interior of the wall gives a dull, dead appearance, showing that the extract of life which dominates in a graphite crucible has been entirely destroyed.



CRUCIBLE SHOWING A LEAK.

†President Bay State Crucible Company, Taunton, Mass.

This is one of the principal causes for "pin holes" or "leaks." These occur in ninety times out of a hundred just below the bilge, and the general belief has been that they are caused by some foreign substance through accident, but how is it possible for a maker to place this matter in this particular spot every time? We do not wish to convey the idea that a severe punishment prolongs the life of the crucible, because a parallel might be drawn between the life of a crucible for brass against one for steel. Brass, as a rule, melts at a temperature below 1,850 degs. F., while steel requires more than 2,800 degs. At the same time, with the common practice in

most steel plants, the crucible rarely exceeds four or five heats. In a steel foundry where a crucible is poured immediately at its melt, and re-charged again and again until its finish, it is no uncommon thing to secure from 8 to 11 heats. It is on the strength of these facts that we prove our argument. We doubt very much if this subject has appealed to the average foundryman, because, in our talks with many of them, they, as a rule, seem to think that "soaking" has nothing to do with the life of a crucible. We present these facts with the hope that they may create a stronger interest between the crucible maker and user.

LATEST DEVELOPMENTS IN MONEL METAL

SOME PRACTICAL SUGGESTIONS FOR THE MECHANICAL WORKING OF THIS INTERESTING METAL.

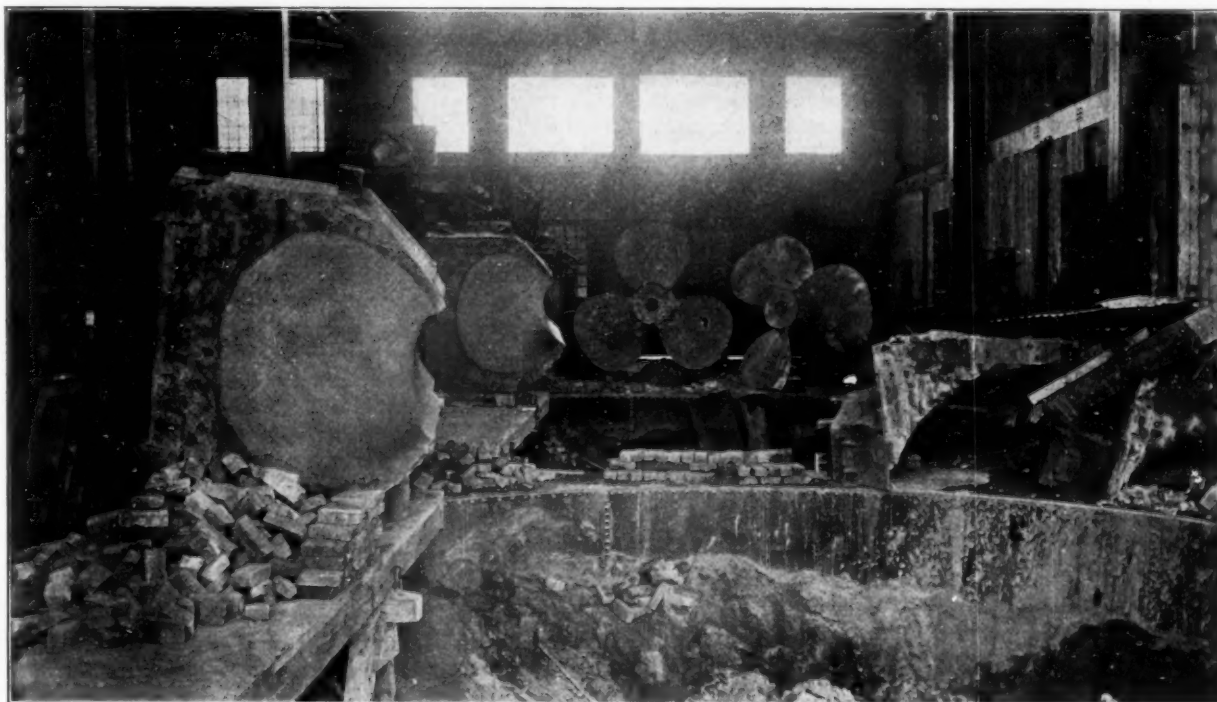
By W. E. OAKLEY.

About nine years ago there was introduced to the engineering field a new alloy of nickel and copper, containing about 68 per cent. nickel, the balance being copper with a few per cent. of other materials, chiefly iron. As this alloy was derived directly from a nickel-copper ore, it was known as a "natural" alloy, and in time received the name of "Monel Metal," after Mr. Ambrose Monell, president of the International Nickel Company. The discovery and manufacture of this alloy originated with the International Nickel Company, who have re-

dered it very resistant to the effect of steam. This combination of properties made it highly suitable for use in connection with steel for seats, discs, and stems for superheated steam valves. Other experiments proved its advantages for pump rods for use under trying conditions.

As a result of these experiments and tests, the commercial development has been rapid.

For example, its resistance to salt water corrosion has led to the use of Monel metal bolts first, in condensers using salt water, and later for general corrosive condi-



VIEW OF FOUNDRY OF BAYONNE CASTING COMPANY, BAYONNE, N. J.

maintained the sole producers. Several years were passed in investigation and experimentation, considerable quantities being used for service tests of various kinds. With larger knowledge came increased demands and as its non-corrosive properties were proved, it entered more and more into use, chiefly in marine construction. The most striking demand was for the propellers of naval vessels.

In the early experiments it was shown that the metal was of high strength and later investigation proved that it maintained its strength through a high range of temperatures. The high nickel content brought the coefficient of expansion to about that of steel and also ren-

tions. The action of the metal in resisting superheated steam has led to its adoption as a metal for turbine blading with great success. It has also been used for stems and valves for high pressure fire service. Laying aside the developments of the past, it is the intention of the following article to note some of the applications which have been made during the year 1913; to indicate the spread of knowledge on certain phases of the subject and to name some of the developments which may be expected in the near future, as forecasted by experiments now in progress.

Prominent among the advances of the year has been the spreading of knowledge concerning the best methods

of machining. To the small shop, working chiefly with brass, machining has been one of the greatest handicaps, since a tool properly shaped for the turning of brass is absolutely unsuited for Monel metal. The tendency of Monel metal is to drag in very much the same way that copper does while at the same time the relative work required is about twice that required to machine brass. To meet these conditions, the tools should be ground as in Fig. 1, very keen with ample clearance. The lathes should have ample power and the tool steel used should be a good high-speed steel. A test made on a 36-inch triple back geared Pond lathe at the Pond Works of the Niles-Bement-Pond Company demonstrated that, work-

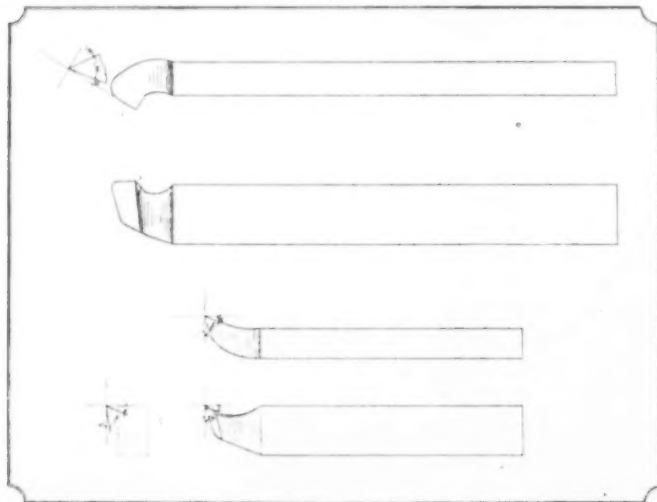


FIG. 1. PROPER SHAPE FOR TOOLS FOR WORKING MONEL METAL.

ing under these conditions, it was entirely practicable to rough machine 5-inch Monel metal rounds at a cutting speed of 120 to 140 feet with a quarter inch cut and a

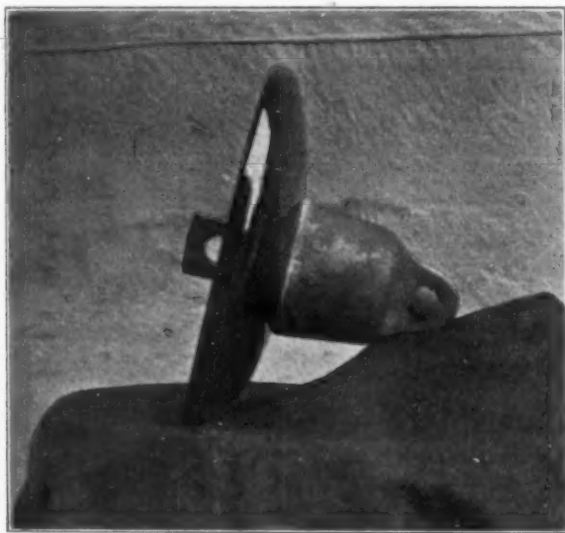
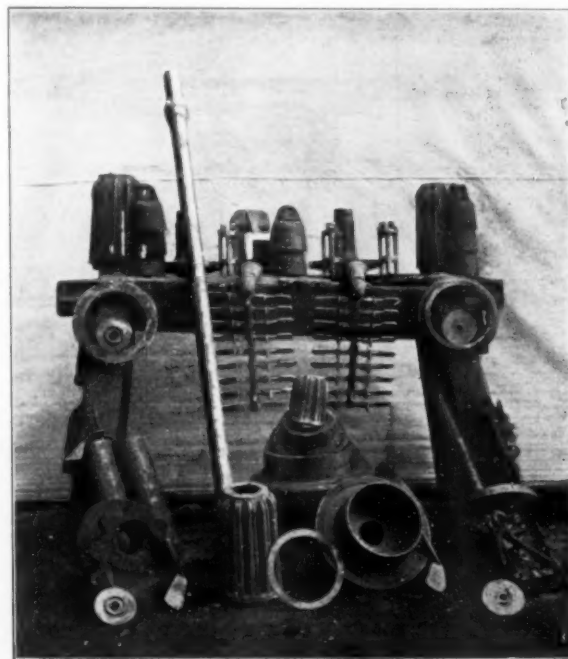


FIG. 2. HIGH TENSION INSULATOR CASTING OF MONEL METAL.

thirty-second inch feed. As an aid to those who have had difficulty in this respect the Bayonne Casting Company have prepared a small sample tool showing the proper angles for grinding, which is furnished to those who desire to observe at first hand a properly ground tool.

Perhaps the greatest single work in Monel metal during the year has been the production by the Bayonne Casting Company of the castings for holding the high tension insulators for the Panama Canal. As can be

seen from Fig. 2, these consist of a bell-shaped casting of about 2½ pounds weight into which is cemented the porcelain saucer insulator. A Monel metal eye-bolt is in turn cemented into this and is fastened to a second insulator for double insulation or to the wire holder by means of a Monel metal pin. To complete this work 100,000 castings were required, ranging in weight per piece from one-fifth pound to 2½ pounds. The testing of these castings involved the making of 172 tensile tests, the specifications being those of the United States Navy. The adjoining table shows in comparison the specifications and a general average of all tests made in prosecuting the work:



SOME MONEL METAL PRODUCTS.

	Speci- fications.	Tests.
Yield point (pounds per square inch)	32,500	37,093
Tensile strength (pounds per square inch)	65,000	72,281
Elongation in 2 inches (per cent.) ..	25	34
Reduction of area (per cent)	Not specified.	32

The use of Monel metal for this service shows very strikingly the relative severity of atmospheric corrosion in the tropics and in the temperate zones; the material generally used being galvanized malleable iron.

Another notable development of the year has been that of both drop and hammer forgings. The production of both classes of forgings demands the most exact knowledge of the proper methods of heating and working. Owing to this the progress in the past has been slow. The gradual dissemination of the proper knowledge culminated last year in a production greatly exceeding that of any previous year. Not only was the tonnage greater, but the number of plants producing satisfactory forgings was also increased. Most striking was the adoption of Monel metal forgings for the valve stems for the fire hydrants of the high pressure fire system of the city of Boston. Their specification came only as the result of long and careful investigation of the city engineers, and marks the entrance of Monel metal into a hitherto untouched field. The production of forged turbine blades was also the greatest in the history of the metal. A general average of the inspection tests made on the forgings

for the Boston Board of Water Supply is shown in the following table:

Yield point (pounds per square inch).....	56,489
Tensile strength (pounds per square inch)....	84,318
Elongation in 2 inches (per cent.).....	38.6

Looking to the future development, one of the most important questions to be answered is that of the ability of Monel metal to resist the destructive action of high temperatures and of gaseous corrosion above a red heat. The strength has been determined for temperatures up to 1,250 degrees Fahrenheit and it has been shown that it resists remarkably the weakening effects of high temperatures. It is well known that Monel metal does not scale, as does steel, but that the oxide forms a thin adherent coat which slowly thickens under oxidizing conditions. Of the effect of neutral and reducing atmospheres and of atmospheres where the action is alternately reducing and oxidizing little is known. The widespread use of hot points of Monel metal in annealing and enameling ovens would tend to show that it has a place in resisting oxidizing conditions. Its successful use for hot tubes for gas engines also furnishes additional evidence.

Physical properties:

Melting point	1360°C. (2480°F.)
Specific gravity (cast).....	8.87
Weight per cubic inch (cast).....	0.319 lbs.
Weight per cubic inch (rolled).....	0.323 lbs.
Coefficient of expansion (20 to 100 C.)...	0.00001375
Electrical resistivity	256 ohms per mil-foot
(Temp. Coef.)	0.0011 per 1 F.)
Electrical conductivity	4% that of copper
Heat conductivity	1/15th that of copper
Shrinkage	1/4 in. per foot
Tensile tests on hot rolled rods (average):	
Yield point	55,587 lbs. per sq. in.

Tensile strength	88,232 lbs. per sq. in.
Elongation in 2 in.	42 per cent.
Modulus of elasticity: 22,000,000 to 23,000,000.	

Torsional tests on hot rolled rods:

Shearing stress—lbs. per sq. in. on remotest fibres—	
At elastic limit	31,796
At ultimate load	79,053

Forms in which Monel metal is made:

Hot rolled rounds—Carried in stock in the following sizes:

2 in. to 3 in. by eighths

3 in. to 4 in. by quarters.

Hot rolled squares and hexagons—Carried in stock in the following sizes:

1/4 in. to 2 in. by eighths.

Castings—Any size up to 25,000 lbs. in one piece.

Wire—Annealed or hard in all sizes down to .003 in.

Wire cloth—200 mesh and coarser.

Forgings—Smooth forged, rough turned, or finished.

Bolts, nuts and washers.

Tie rods.

Lag screws.

Pump liners—Rough or finished.

Pump rods.

Valve stems—Cast or forged.

Golf club heads.

One of the important developments in monel metal during the year was the consolidation of the Oakley Foundry and Machine Company of Astoria, Long Island, with the Bayonne Casting Company under the latter title. The two foundries were the only ones in the country who were successfully casting monel metal.

A new publication dealing in detail with some of the above physical properties has just been issued by the Bayonne Casting Company, Bayonne, N. J., and may be obtained from them.

THE PRODUCTION OF THE BRUSH BRASS FINISH BY THE AID OF FRENCH SAND

BY A PRACTICAL PLATER.

The brush brass finish still maintains its popularity and is likely to do so for some time to come. The butler or brush silver is coming rapidly to the front as a popular finish and will probably be in great demand during the coming year. Both of these finishes when they have applied blacks in the backgrounds such as dead Jap-a-lac that can be readily applied after lacquering and wiped out easily without affecting the lacquered finish, give beautiful contrasts and should appeal to popular taste.

The methods in vogue to produce the brush effect are numerous and varied. Some finishers still use the oil and pumice in connection with the tampico wheel; others have discarded this method and use only pumice stone and water with the tampico wheel. This method prevents staining from the mineral oils frequently used, and is much easier to cleanse, there being no oil to contend with. The difficulty with the use of pumice stone mixed with water is that it concentrates and becomes quite hard and causes considerable waste. It has been customary to mix a cheap grade of flour with the pumice to make it more flocculent and easier to apply to the articles to be finished. A good many platers have discarded the tampico brush and use the regular brass scratch brush of the crimped-wire variety.

The latest method is to use French sand as the brushing agent in connection with the brass wire

brush. This material does not cut like pumice stone, does not produce dead lustre streaks as when a little too much pressure is applied in using pumice stone or when a new wire brush is first used, but gives a beautiful semi-lustre that is much admired. In this finish another advantage is that it remains flocculent and can be washed and used over again.

French sand is largely used in producing fine brass castings as a facing sand. Windsor Locks sand is a similar material and would probably answer the purpose just as well. As this is a domestic sand, and if it answers the purpose, it would be considerably cheaper. French sand is an imported material and can be purchased from foundry supply houses.

In using dead black Jap-a-lac to produce the imitation platinum blacks upon the brass or silver surface, after the articles are lacquered, the best medium for wiping out is a mixture of equal parts of boiled linseed oil and turpentine. It will remove the pigment quite readily without affecting the lacquer, and leaves a natural gloss to the lacquer.

CHANGING DEMAND FOR UTENSILS IN BOMBAY.

It is stated that copper and brass ware is being displaced in Bombay by other materials. Some of the workers are now making vessels out of imported German silver sheets, and these are often preferred to brass or copper, especially among the wealthier classes. Another sub-

A FEW THOUGHTS ON MODERN BRASS FOUNDRY

SOME REFLECTIONS ON MOLDING TROUBLES BY A PRACTICAL FOUNDRYMAN.

By W. J. REARDON.*

In noting these few thoughts regarding modern brass founding, I have in mind that we all want to advance to the newest and most efficient methods, and I believe in the words quoted in a recent periodical to the effect that we must change our old ideas to the most recent advanced ones, which have proven more practical than the old ones, and as an illustration the article further states "that we can build a fire underneath a horse and move him, but not so with an automobile." You can pick out many subjects on which you can write about and one of the most important ones to my mind is the disposition of the foundry by-products.

Abraham Lincoln once said, "If we could first know where we are and whither we are landing, we could better judge what to do and how to do it, and, furthermore, we should not worry if we are a weed, as we have the satisfaction of knowing that we will never end up in a vase." It is my practice to look at matters from every angle, pick out the best and stick to it, but one must try the seemingly bad ones with the good as not all bad suggestions are bad, neither are the good ones all good, and so on all the way down the line of foundry troubles. One must associate his working hours with a little horse-sense, which in the finish means good castings, and what is there more desired than good castings? So I would request that you lend an ear to the few thoughts I have written, hoping that they may be of some use to my associate foundrymen.

Granting that most everyone differs in their methods, and I have studied many of them, I do believe the best decision to arrive at; is what difference in dollars and cents does one method show over another, bearing in mind that good castings are equivalent to a saving in money? Do not be like the political leader and detective whom upon meeting each other one day, went through the following: "Well, did you discover anything in Smith's past life that we can use against him?" Detective: "Not a thing. All he ever did before he came here was to sell awnings." "Well," said the political leader, "that's just what we want. We'll say that he has been mixed up in some decidedly shady transactions."

Unfortunately the brass foundry foreman in a great number of our so-called modern foundries has not the power invested in him by the management to choose the method to be employed in using up his by-products, machine shop turnings, emery grindings, wash metal and floor sweepings. In many cases he runs a chance of the firm looking for a new foundry foreman should he suggest that to use up all these products most efficiently they should be refined before using in castings and rather than run this chance uses the by-products up a little at a time, with the result that the castings are rough, the metal has eaten into the core and he is blamed for making bad cores, and the castings are black and dirty looking.

The foreman is told that the sand he is using is not of the proper grade. Next scene: The superintendent calls up or visits another foundry and asks what kind of sand they are using; as is customary he readily receives the information and the new sand is immediately ordered for his foundry. The result: castings are a little better and everyone is delighted now that it has been discovered what has been causing all the bad castings. The foreman is anxious that everything should be right and he agrees with them; however, he is not using as much scrap

as formerly, and after a short time the superintendent comes to him and explodes something like this: "What's the matter with you, anyway? Can't you see all this scrap piling up? Why haven't you been using it up? Now get busy and use this material up. We can't afford to have this scrap pile up on us. Don't you know that this pile means money, without any means of moving itself? Now start right away and use it up in making the metal for your castings."

Once again we hitch the horse behind the cart and the foreman gets busy and uses up the scrap. The castings are not so bad for a little while, then they get bad and then a little worse. They are up in the air again and this time the superintendent starts the old familiar refrain, "Where can I get a good foreman?" But listen, just as your servant can only discharge his duties when he is suitably fed, suitably clothed and suitably housed, so the foundry foreman can only produce good castings when he is given good metal to work with, a little say as to the methods to be used and a little encouragement.

It has often appealed to me that in our efforts to cut down expenses that we sometimes start at the wrong end, and it is an old saying that we often spend a dollar to save a cent, whereas we could have just as easily spent a few cents and saved a dollar. I have often thought of how bad a junk dealer will fool the brass foundry man, or put it the other way, if you wish. How bad a brass foundryman will allow a junk dealer to fool him. For the past twenty-five years I have known of some foundrymen, who, not satisfied with attempting to use their own scrap in the state in which it is produced, have bought scrap brass full of iron, dirt and grease, and each 100 pounds he has purchased represents 90 pounds of very poor metal when melted, for in the first place he does not know what is in it, and neither does the junk dealer. So all the satisfaction gained for the time being is that the superintendent and purchasing agent think they have bought cheap brass and it will show a good profit in castings, but they have figured only the first cost. The foreman is asked to make the highest grade of brass castings, and it is surely amusing sometimes to hear the machine shop foreman, the superintendent or manager try to tell what is wrong when 20 per cent. of the work will not stand the pressure. They will say that you did not watch, there was dirt in the mold, you do not know how to melt metal and that you should use a flux on your metal; then the machine shop foreman tells what he knows about a foundry, and forthwith will advise that you should use a facing on the molds, in fact everybody along the line kicks about the bad castings, even when they are good, not to say anything when they will not stand a pressure test. If the foreman should suggest that it may be possible that the dirty scrap, copper oxide, wire or scrap brass and perhaps some aluminum or antimony mixed with the brass was causing the trouble; but no, he has already heard the final analysis of the trouble from those higher up. Right here is where he should change his sand.

I have found antimony just as injurious as aluminum for valve and plumber's fittings when tested under pressure. You may be told you do not know what you are talking about, as they have made these same castings for years out of the same metal and never had any trouble. This statement appealed to me like the little boy that had the toothache, and after it was all over he forgot all about having a pain.

*Foreman Brass Foundry, Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

I could never understand why the brass foundry owner still sticks to the thumb rule of mixing brass. Iron and steel foundries must know how the silicon, carbon, etc., is running in the metal before making into castings, and the machine shop foreman must know the material he expects to turn up. However, in many cases the brass foundry is expected to take all kinds of junk and make it into good material. Now it stands to reason that if you should expect the foundry to produce good work you must furnish good material so that the foreman will know what he is using, as different composition requires different methods. My sympathy is with the foundry foreman when preparing the molds and cores, if he is compelled to use all kinds of scrap brass. I admit there is temptation to purchase old scrap two or three cents a pound cheaper than a good grade of ingot brass systematically and efficiently made to specification. I do dread cheap brass ingot which is nothing more than old brass run down in small lots in crucible furnaces, for if you have ten pots you are sure to have ten different mixtures. Also the sulphur from the coke is very injurious, especially for metal that is used for castings that have to be tested for air or water pressure. Your efforts can be very costly sometimes in your desires to be saving, and I know of a firm who purchased crucible ingot brass to make their castings. The result was that their castings were black and dirty and would not dip or polish up; suffice to say that you could not find any crucible brass ingot in this foundry now. Another case where crucible brass ingot was tried out, the castings were giving a lot of trouble, and upon an analysis being taken it showed one-half per cent. of antimony.

I would not advise the use of ingot brass made in crucibles, as there is no chance to refine the metal by poling, as all the metal would jump out of the crucible and all that you can call such material is simply rerun scrap. The amount run in each pot is so small that a chemical analysis is impossible from a cost standpoint, for the best that you ever get is an average analysis by selecting an ingot from each crucible, and by all means of figuring good brass founding that is not sufficient and to my mind and experience I cannot emphasize this point too strongly.

It is the writer's opinion that all brass foundries should refine their scrap before using it, or have it refined, not by someone who merely runs it into ingot form by melting in crucibles, and which process does not eliminate your trouble but gives it to you in bunches. My experience has been that to refine scrap in an open flame furnace is the best and most efficient practice.

By this method you can make 10,000 pounds per heat and get a correct analysis, whereas if it is run in a crucible you would have at least thirty heats and every one different. Furthermore, when run in an open flame furnace any objectionable element can be eliminated. Bear in mind the fact that iron, aluminum and antimony can be entirely eliminated, the metal can be poled and a homogeneous alloy sample can be taken from time to time and a test made for any objectionable matter. For example, a test for iron is taken by pouring a small ingot and drilling it very fine, next run a powerful magnet through the drillings, and if any iron is present you can readily detect it. You can readily examine the structure by the microscopical examination, and I do believe we already owe much to the microscope and chemical analysis, and one can readily understand that by this microscopic test we have more exact means of ascertaining the various troubles that confront us. One should at least give this method a trial and I am convinced that the results if noted will convince and emphasize the fact that non-ferrous alloys are deserving of much more study and attention than they usually receive.

Every precaution should be made to meet specifications as demanded from the foundry, and the first thing you should do is to furnish the foundry with material, not old rerun scrap, and I believe that here is a suggestion and a line of investigation that if properly carried out may cause many foundries to use a good ingot brass, even in preference to virgin metal. The advantages to be gained by using a good ingot brass already mixed, the analysis guaranteed and made by a reliable manufacturer in large lots will show the following:

It will be somewhat cheaper than the same mixture made from virgin metal, a very noticeable saving in labor as against the labor cost of handling and weighing the copper, tin, lead, zinc, etc., not so much money tied up in carrying a stock of the various virgin metals, saving in fuel as the temperature required to run down a mixed ingot is considerably less than is necessary for the first melting of the copper, a saving of crucibles and time as one more heat can be obtained per day than when melting the copper, and there is every convenience in having the ingot already mixed. There is no chance for the furnace man making a mistake in not putting the correct mix in the furnace.

In closing I wish to say that in using an ingot, if properly made, and bear in mind that many are not, you are sure to get better results than when using virgin metal, and when all is summed up you will find that the ingot is cheaper than scrap brass and by careful scrutiny of comparatively insignificant matters you will find that economies can be effected.

BLACK FINISH ON BRASS.

A black surface similar to that on the standard of a desk telephone may be given to brass articles as follows: Mix 1 ounce nitrate of copper with 1 ounce water. Then mix 1 ounce nitrate of silver with 1 ounce water. Then combine 1 part of last solution with 2 parts of the first and add 3 ounces water. Heat article to 250 degs. F. and give it two coats of solution with set-in-rubber brushes. Afterwards, brush off the fluffy smut. The resulting brownish-black color may be changed to dead black by immersing the article for 5 minutes in a solution of 2 ounces liver of sulphur in 1 gallon cold water, removing it, heating and brushing. The surface may then be lacquered or waxed.

BRONZE FOR CUP RACE YACHTS.

Manganese bronze will be employed for the plates of the American cup defender being built by the Herreshoff Manufacturing Company, Bristol, R. I., and also for the frame and plates of the defender known as the Gardener boat, while the third participant in the defense of the national cup, the Tri-City boat, being built by the Bath Iron Works, Bath, Maine, will be wood. The bronze for the above boats has been furnished by the American Manganese Bronze Company, Holmesburg, Pa. It is understood that Sir Thomas Lipton's boat, the Challenger, will also be built of bronze, though the character is not known.

CAST ANODES.

Cast anodes are better adapted to the deposition of brass than are those of sheet metal, as they disintegrate more freely. They should contain, preferably, 66 per cent. copper and 34 per cent. zinc.—H. E. Willmore, August Quarterly American Electro-Platers' Society.

THE INFLUENCE OF STYLE ON THE ART METAL WORK OF MODERN TIMES

THE RENAISSANCE, ITALIAN AND FRENCH.

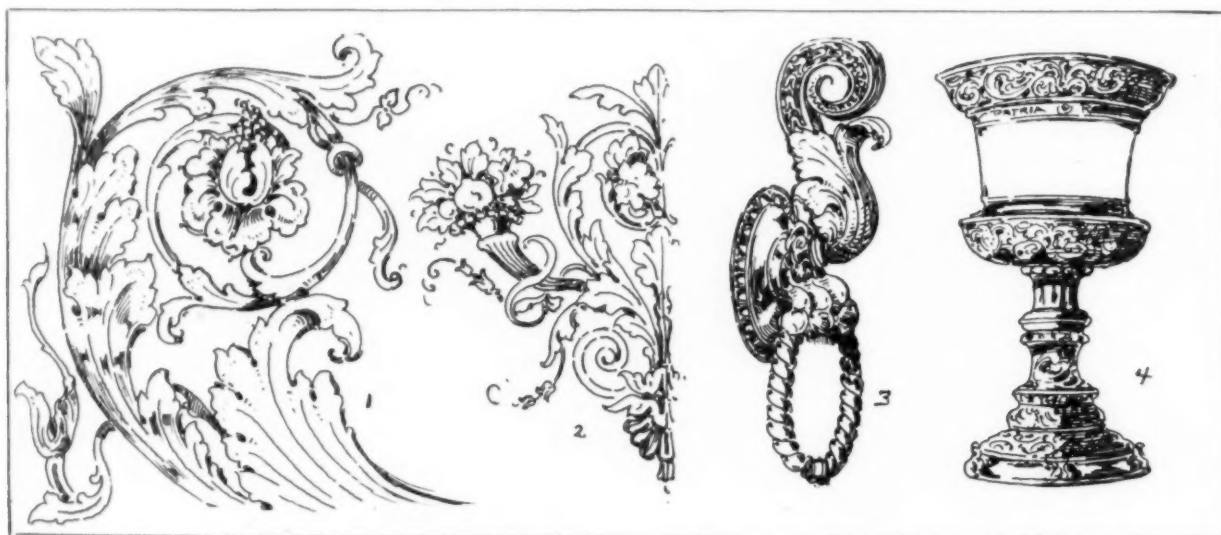
By A. F. SAUNDERS.*

The origin of the Renaissance in Italy during the latter part of the 14th Century, marked the beginning of a complete revolution and an almost un-interrupted evolution in the decorative art of all the Christian countries of Europe. It was the outcome of the complete change from the conditions associated with feudalism to the newer and broader ideas of Religion, Art and Science, which had begun to take root during the middle of the 14th Century. The Renaissance style in spirit was a return to the classic ideals of the Greeks and Romans. It was a protest in art against any further development of the Gothic a purely ecclesiastic style which had already passed its best day.

The Gothic as a style had never made much progress in Italy as it did not satisfy the highly artistic temperament of the Italian whose leaning had always been more or less toward classic art, with them one might almost say the Gothic was dropped over night and the Renais-

relief the extremities blending into the background, affording a very pleasing effect. This treatment of ornament is most noticeable in the work of the metal craftsmen of this period, of which perhaps the best known is the celebrated Benvenuto Cellini. It seems almost safe to say that the best examples of the metal work of he and several other craftsmen of the 15th and 16th Centuries have never been surpassed or equalled in fine workmanship, even to the present time. Some critics may take issue with me in this but I feel safe in making the assertion as I have had an opportunity of making a study of both, old and modern art metal work.

The decorative details of the Italian Renaissance are many, chief among which are the half flower and foliage effects growing out of and surrounded by a wealth of scroll work, half figures, both male and female, growing out of the conventionalized leaf of the acanthus; arabesques, the cartouche; mascarons of past heroes, gods



ITALIAN RENAISSANCE.

PLATE I. No. 1—Detail, Scroll Work, late period, 1600. No. 2—Detail, Fragment of Panel in Palace at Florence, 1540. No. 3—Bronze Door Knocker, Strozzi Palace at Florence, 16th century. No. 4—Beaten Silver Goblet, Gilt and Chased (work of Cellini) 1540.

sance substituted. They practically took up Greek art where the Roman had left off, and carried it to an exceedingly high point of decorative development.

The student of styles should here fix in his mind the fact that the Renaissance style began as a classic style, that it had absolutely nothing in common with the Gothic as it succeeded that style in Italy completely. At the opening of the 15th Century it can be truly said that Italy easily led the entire world in architecture, plastic art and in painting. By that time this new art movement had become a distinct style and its influence soon spread to the art of all Europe, especially in France, when the returning army of invasion under Charles VIII. brought back wonderful tales of the luxurious homes of the Neapolitans. Correctly speaking, the Italian Renaissance is divided into three epochs: (1) The early, purely classic, 1420—1500; (2) The high, real beginning of a new style, 1500—1540; (3) The late, a higher development and final decline, 1540—1600.

At its best period it is a style of great decorative character, delicate in line but strong in detail, scroll forms are freely used and usually worked up in low

and goddesses, pagan deities, caryatides (supports composed of half figure, half foliage or ornament); the classic acanthus leaf is almost always in evidence as well as many other purely Greek motifs. By consulting the several examples of pure Italian Renaissance shown in Plate One, the reader may get some idea of the charming decorative qualities and characteristics of this style as developed in Italy during its best periods.

In France, the Renaissance or (re-birth) was not as in Italy a protest against the Gothic, a style purely of French origin and reaching its highest state of perfection there. On the contrary, its influence was not felt until after, as before mentioned, Charles VIII. returned with his army from his campaign in Italy. It was then that the art loving people of France had their eyes fully opened to the great advancement and high state of civilization of that country. Following Charles, Louis XII. had hardly become king in 1498 when he too led an army into Italy and thus continued the education of the French people as regards Italian art. He induced several Italian masters to return with him and thus the Renaissance secured an actual and visible foothold there. When Francis I. became king, 1515, France had by this time

*Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

become wild with enthusiasm for the new style, as this ruler had a natural love for art, he took great pains in securing the best Italian architects, sculptors, metal craftsmen and painters to carry out the establishment of a new style in France. Da Vinci Cellini, Della Robbia, Vignola and others found him a generous patron.

The new style spread everywhere, the church alone clinging to the old Gothic traditions, yet it was many years after the Gothic had been entirely abandoned in Italy that its influence was totally superseded by a pure French Renaissance style. A sort of mutual interchange took place at first between the two styles, each became imbued with the elements of the other, but by the beginning of the second period the style had become entirely free of any Gothic character whatsoever, and under Henri IV., famous as Henry of Navarre, we find a characteristic French style at the very height of its development. As in Italy, the French Renaissance is divided into three periods, as follows: (1) Early, Charles VIII., 1483—1498; Louis XII., 1499—1515; Francois I., 1515—1549

It was one of those transitions or intermediate styles that connect style periods, it was the connecting link between the Louis XIV. and the Louis XV., not possessing distinctive features enough to be designated as a true style.

Upon the crowning of the young Louis XV., began an era of corrupt extravagance which can plainly be followed through the decorative style of the period. The elegance and majestic grandeur of the Renaissance gave way to mere prettiness and gaudy show. The absence of symmetry, the impossibility of discovering two mutually echoing elements in the composition are characteristic of the design. A new but very much lengthened acanthus takes the place of the rich, broad treatment of the Renaissance, in short, its decorative motifs were an arrangement of fanciful shell work, a conglomeration of scrolls, flower forms, cupids and rock work, from which it derives its name Rococco (rock and shell). We have little knowledge of the work of the metal craftsman during this period other than what the publications of Meissonier, leading designer of the court, show us.



FRENCH DECORATIVE STYLES.
PLATE II

PLATE II. No. 1—Upper Section of Bronze Wall Sconce, by Berain, Louis XIV period. No. 2—Silver Candlestick, by "Le Brun," Louis XIV period. No. 3—Rococo Detail, Louis XV period. No. 4—Silver Gilt Candlestick, by "Meissonier," 1730, Louis XV period. No. 5—Silver Gilt Candlestick, by "Leufforge," Louis XVI period. No. 6—Empire Detail, after work of "Normand"; design based on Roman style. No. 7.—Empire Detail, showing Greek influence.

(period of introduction). (2) Middle, Henri II., 1549—1559; Francois II., 1559—1560; Charles IX., 1560—1574; Henri III., 1574—1589; Italian influence continues, high development. (3) Late, Henri IV., 1589—1610; Louis XIII., 1610—1643; highest development, Baroque influence introduced. With the introduction of the Baroque, during the reign of Henry IV., the style now started on the road that led to the Rococco of Louis XV., finally terminating in the Directoire the connecting link between the Louis XVI. and the Empire of Napoleon. As the space devoted to these several papers is limited, I must pass but hastily over the styles under the several Louis's.

Probably the noblest period of French decoration was during the time of Louis XIV. Under the great Le Brun, there developed an organization of art workers that made it a period of decorative art second to none. So great was the influence of this master artist and craftsman that it might almost be called the Le Brun style, it was characterized by a larger introduction of curves and a greater departure from the classic Greek. Following the death of Louis XIV., the short period under the Regency had its influence upon the decorative art of the country.

Unquestionably the style had some individual beauty of detail but the governing principle was a debased one, which is not to be wondered at, as artistic production has ever been governed by principle since the beginning of civilization. The Louis XVI. is the simplest of the three Louis styles, it was an antique style influenced by ancient Pompeiiian forms of ornament, also characterized by a return to the one of the straight line and by a frequent use of floral garlands, pastoral effects in the form of rakes, hoes, sickles, bow knots, etc.; sentimental forms, such as bows and arrows, cooing doves, and torches, medallions, etc. Fluting is prominent in many designs of the period, it was in every way a style more refined, a style for the home rather than the court. As in the case of the previous style, there are practically no examples of metal work of the time of Louis XVI. left as practically everything made of the precious metals was melted up and went into coin, but we have many engravings of the designs of those French craftsmen which give us an idea of their work.

The connecting link between the Louis XVI. and the Empire of Napoleon is termed the Directoire, not a true style but like the Regency a short period of transition,

developing a few characteristics of its own and was really the beginning of the Empire Style minus the personality of Napoleon. It is doubtful if the Empire can be classed as a typically French Style as it was simply a composition of classic forms concentrated in the personality of one man and he a Roman imitator. It was a grand specimen of advertising of a vainglorious ruler, his emblem appeared everywhere. After his Egyptian campaign, the Sphinx and other Egyptian details was introduced. It is hardly a style worth while as it lacks

any originality whatsoever and is but a poor copy of the classic Greek and Roman. The next paper will take up the Renaissance in England, Germany and the smaller countries.

Table of French Period Styles following the Late Renaissance under Louis XIII.: Louis Frieze. Louis XIV., or Quatorz, 1643—1715; Louis XV., or Quinze, 1723—1774; Louis XVI., or Leize, 1774—1792; The Empire of Napoleon I., 1804—1814.

(To be continued.)

STANDARD NOMENCLATURE

ITS ADVANTAGES AND DISADVANTAGES.

By ERNEST LEWIS.*

During the last year or so a good deal has been heard of standardizing the names of alloys. A committee was appointed to deal with it by the Institute of Metals and it has also been brought forward in America—the home of standardization.

In a way we must admit that there is a lot to be said in its favor, but at the same time there is a lot more to be said against it. Perhaps a compromise would be the best policy. We do not think anybody would be misled if they ordered, say, a ton of manganese bronze rods and obtained an alloy of copper 56 per cent., iron 1 per cent., manganese .25 per cent., tin .75 per cent., and zinc 42 per cent. Is there anybody in the trade who would expect rods containing from 8 to 10 per cent. tin for such an order?

Much has been written about the miscalling of brasses, but we would point out an engine brass is not a brass in the metal roller's sense of the term. To an engineer a "brass" is a part of a machine, he knows its composition is not the same as rolled metal, to him it is a copper alloy with a more or less high percentage of tin and lead with perhaps a trace of phosphorus. Where can there be any misnomer in this case? No one is deceived when they buy scrap "brasses."

It may be rather unscientific to have the same name for two different alloys, but there is no deception. It might be better if "brasses" of engines were always referred to as "engine brasses." There are cases of deception, however, in the naming of alloys which ought to be done away with. How many tons of so-called phosphor bronze is sold which contains no phosphorus? How often do we come across manganese bronze without any manganese? How much gun metal is sold with less than 3 per cent. tin? We agree that the term gun metal should be reserved for alloys with 8 per cent. tin and upwards and other gun metals with 5 to 7 per cent. tin, and large percentages of lead should have the designation "lead gun metal" applied to them. Phosphor bronze should have at least 0.05 per cent. phosphorus. It is often said that traces burn out in melting, but it will not if present in sufficient quantity to be of any practical value in the alloy. Manganese bronzes are rather misleading; in the U. S. A. the percentage of manganese is very low and the iron very high, but in England the conditions are frequently reversed. The composition varies with the fancy of the manufacturer.

Among the alloys which are said to give rise to ambiguity there are the German silvers. We are unable to see where there is any ambiguity at all in this metal, every one knows the trade qualities of this alloy and the approximate composition. If a manufacturer likes to register a trade mark and call an alloy by a fancy name, why should he not reap the benefit of his enterprise? We must remember that the manufacture of German

silver is a difficult art and a special method of treatment known only to the manufacturer is probably applied in making this particular metal to give it its special properties. As was pointed out at the recent discussion in Birmingham, manufacturers have to study invoices, they have customers to think of; that is what scientific gentlemen don't have to bother about. They make suggestions, excellent from the scientific point of view, but often useless from the point of view of the maker and consumer.

One speaker at the discussion said that he would suppress such names as gun metal, German silver, aluminum bronze and manganese bronze, but he did not say what he would call these alloys. Gun metal is a more familiar name than phosphor bronze, it was in use ages before phosphor bronze was invented. It would not be so bad calling aluminum bronze, 10 per cent. aluminum-copper, but when it came to calling manganese bronze, "2 per cent. manganese + 1 per cent. iron + .75 per cent. tin + 56 per cent. copper — zinc brass," most people would prefer the older and much simpler term of manganese bronze, which misleads nobody, although its composition may vary somewhat.

We fail to see in what way electrolytic copper needs suggestive definition, unless the remelted ingots from America are referred to, but electrolytic cathodes are a well-known commercial form of copper; if the term "American B. S. Ingots" were applied to the remelted cathodes it would perhaps be better. Arsenical copper is now a well-known class of tough copper, which is known to possess a certain percentage of arsenic, limited according to the wishes of the engineer who uses it. The Welsh process of copper smelting is gradually going out of use and in time it will doubtless be as obsolete as the calamine process of making brass. When this occurs the names "Tough Copper," "Best Select" and "Cathodes" will refer to certain well-known qualities.

The names used for white metal alloys for lining bearings need discriminating or anyone is liable to be misled. For example, the term "Babbitt" should only be used for alloys approximately of the original composition with a high percentage of tin. For other alloys makers have their own registered names and any maker will supply an alloy to a guaranteed analysis, so that the most suitable alloy for any particular purpose can be obtained.

There are numerous alloys which have been named after the original makers such as Muntz Metal, Delta Metal, Aich Metal, and so on; it is quite useless for any committee to suggest that such names shall be suppressed. They have been manufactured under these names for so long that manufacturers would not listen to any such proposal. Taking everything into consideration there is very little chance of any drastic changes in the way of standard nomenclature being adopted by the trade, but there are some bad practices, which we have pointed out above, that could very well be done away with.

*Consulting Metallurgist, Birmingham, England.

SPECIAL MACHINES IN THE MANUFACTURE OF BRASS GOODS

A DESIGN FOR A MILLING MACHINE FOR MILLING SQUARES AND HEXAGONS.

By ERNEST DIETZ.

In these days of close competition in all lines of manufacture everything tends toward specialization, both of men and machines. This is particularly true of the automobile industry; in fact, it may be said that the demand of the automobile manufacturer for machinery and tools, suitable for the economical production of duplicate parts in large quantities and of a high standard of accuracy, has been one of the chief factors in the development of special machines, or, in other words, of machines to do

through stopping to chuck work, and the total time necessary to machine the piece is practically the time of the longest single operation, plus the time necessary to withdraw the chuck from the spindles and index around.

A still further advance in machines of this type is shown in the six and eight spindle double-head machines. In these tools the work is held in a four or five section chuck, located between two heads, carrying three or four spindles each. These six or eight spindles, carrying the tools for the different operations, operate simultaneously on both sides of the castings or forgings held in the four or five section chuck, while the open section of the chuck is being supplied with a new blank by the operator. As in the single-head machine, loss of time through stopping of the machine in order to chuck work is eliminated and a considerable gain is made through operating on both ends of a piece of work at the same time.

In line with the foregoing and making for higher efficiency in the operation ranking next in importance to

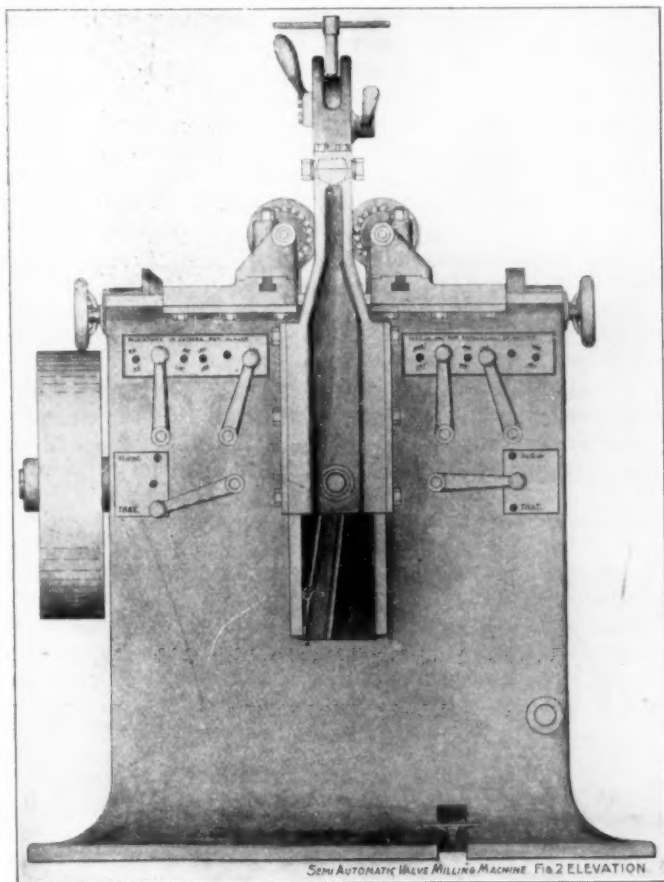


FIG. 1. DESIGN OF A MILLING MACHINE FOR SQUARES AND HEXAGONS.

one thing only, but to do that one thing well. While this tendency is not so marked in the machinery offered to the brass worker, a number of lathes have been designed and developed during the past few years, which may properly be classed as special machines, as compared with the turret lathes, which now form a large part of the factory equipment. This applies particularly to the multiple-spindle, semi-automatic turret machines, the spindles of which, each carrying a tool for a different operation, revolve, and the work is automatically indexed and fed up to the revolving tools by means of a cam strip on the feed drum.

The great saving of time effected with these machines is due to the fact that the four tool carrying spindles operate on four pieces of work at the same time, while the fifth section of the chuck is being opened and the finished piece replaced by another casting or forging. As this is done while the machine is running, no time is lost

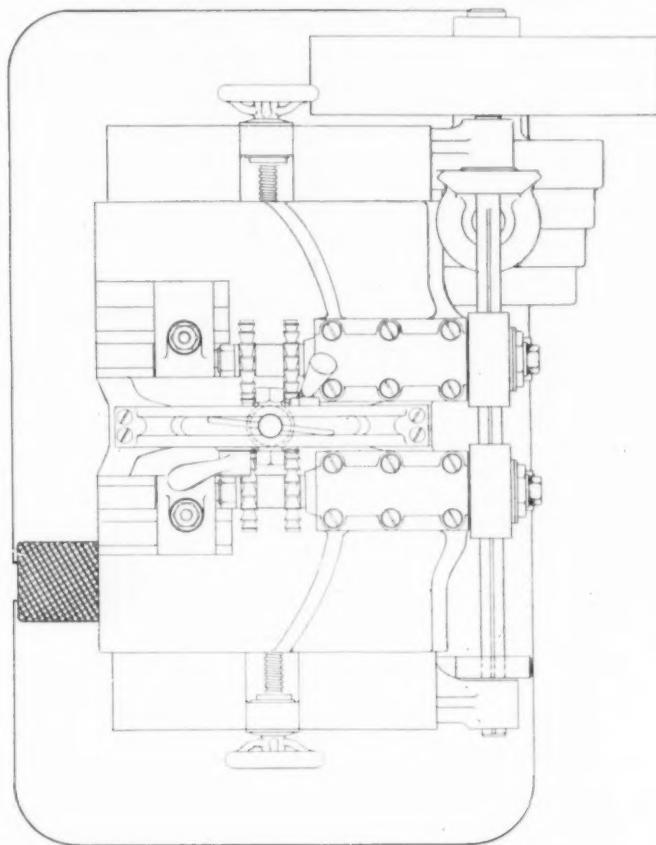


FIG. 2. PLAN VIEW OF MACHINE SHOWN IN FIG. 1.

turning, boring and threading, there is shown in the accompanying illustrations the plan and elevation of a milling machine, designed for the milling of squares and hexagons on the ends of valve bodies and similar pieces. It is a two-spindle machine, operating on both ends of the work at the same time, and using two cutters on each spindle, it will machine four faces with each revolution of the feed gear. The machine is driven at a constant speed either by belt or motor. The illustration shows the machine arranged for belt drive. The speed changes necessary at the cutter spindles are effected through a gear

box in the back of the machine by placing the gearshift and clutch levers shown at the front of the machine in their proper position.

The final drive to the cutter spindles is through a bevel gear-driven splined shaft, which is connected to them through two sets of helical gears. They are encased in a housing which forms a bearing for the shaft and at the same time serves as a receptacle for the lubricant with which the gears are kept flooded. The spindle bearings with their outboard supports are part of a slide gibbed to the horizontal ways of the machine housing. These slides are adjustable longitudinally by screws and the hand wheels shown at each end of the machine. For convenience in resetting these hand wheels have graduated dials. The outboard bearing and the spindle itself are adjustable at right angles with the machine so as to adapt them to different sizes and spacings of cutters.

The cutters themselves are standard side cutting mills $4\frac{1}{2}$ inches diameter or over, used in sets of four and should be kept at approximately the same diameter. For maintaining standard sizes of hexagons and squares, spacing collars of the proper lengths are interposed between the cutters. The cutter arbors have taper shanks fitting into taper holes in the spindles and are held in place by means of draw in bolts extending through the same. The chuck holding the work is carried in the circular recessed housing of the vertical slide. It has one movable member and is adapted to castings and pieces of irregular outline and shape by means of false jaws, machined to fit the work.

The chuck can be rotated in the housing through an arc of about 120 degrees; that is, about 60 degrees on each side of the center line, which is sufficient for indexing squares or hexagons. The machine shown in the illustrations is arranged for hand indexing. This is effected as follows: The handle shown on the right hand side of the machine is pulled forward; this withdraws the locking pin and releases the clamping arrangement, allowing the chuck to rotate freely in its housing. The handle shown on the left hand side of the chuck affords a ready means for turning it to the next indexing position. After it has been so turned the handle on the right

is thrown back toward the rear of the machine. This allows the indexing pin to drop into place and at the same time clamps chuck and housing together into one unit.

The feed mechanism is driven by the splined shaft, driving the cutters through a train of spur gears. Through a gear box and the gearshift levers and clutches shown on the right side of the machine different rates of feed may be obtained. The feed drive being from the cutter spindles makes the rate of feed always a certain proportion of the cutting speed. This is given on the index plates in thousandths of an inch per revolution. This, however, applies to the downward movement of the slide only. A quick return motion with a ratio of four to one brings the slide back to the starting position.

This cycle of operations is performed automatically by the machine. It is started by the depressing of the foot treadle shown on the front view of the machine and ends when the slide has returned to the position shown in the illustration in readiness for indexing to the next position or for removal of the piece as the case may be. When the output is large enough to necessitate the installation of several machines, another saving may be effected by making the indexing automatic.

The cycle of operations will then be as follows: After placing the piece in the chuck the operator depresses the foot treadle. The vertical slide will move downward and return to the starting position, but instead of stopping there, as in the hand-operated machine, the indexing for the second set of faces of the square or hexagon being milled, will be done automatically by the machine, without attention from the operator. The machine will then make another complete stroke in case of a square or two strokes in case of a hexagon, indexing again in the latter case. The feed mechanism will stop with the vertical slide in its highest position ready for another piece. The operator being relieved of the hand indexing will be in a position to look after a second machine. A machine possessing some of the features described, but designed particularly for work requiring indexed milling operations on one end only, such as valve bonnets, will be shown in a later issue.

THE MODERN DYNAMO*

A FEW PRACTICAL REMARKS ABOUT THIS IMPORTANT ADJUNCT OF ELECTRO-PLATING.

BY S. E. HUENERFAUTH.†

This is a subject in which every plater is interested for the reason that without the dynamo or a current supply from some other source, it would be impossible for him to do any plating. You are all familiar with dynamos in connection with the art of electro-plating. Some of you have had years of experience, which dates back to the time when the only machines available were what are known as "B-polar" type of dynamo. These were built in small units with very few parts in the armature, and were generally shunt wound. Today we have nearly reached the climax of perfection in dynamos for electro-plating, for we have the Multipolar Compound Wound dynamo with the Composition Brush, and which will be explained as we proceed with this article.

The development in dynamo construction for electro-plating has been very rapid in the last two and one-half years. The first important step in developing the modern dynamo was the application of the self-lubricating and self-adjusting brush. This has enabled us to overcome nearly all the troublesome as well as objectionable features contained in the old type of dynamos, chief of

which was the brush trouble. To overcome this with the new brush was no small undertaking for the reason that the carbon or graphite brush could not be used on account of very high resistance and low conductivity, but today we are able to secure brushes for electro-plating dynamos, combining all of the necessary features required for low-voltage dynamos, which are low resistance, high conductivity and self-lubrication.

On account of the low resistance and high conductivity it was necessary to provide a brush composed of metal, having a high conductivity, and at the same time it was necessary to provide lubrication in this brush. By applying such brushes with suitable holders, which allow the brush to adjust itself automatically as it wears down—at the same time holding its proper position on the neutral point of commutation—it not only overcomes the most objectionable feature of the older types of dynamos, (which was, as the brushes wore down, they would shift their position on the commutator, and unless they were carefully watched and constantly adjusted, sparking would appear, which resulted in cutting off the commutator), which would soon ruin both brushes and commutator. This has been overcome by the application of the new brush and enables us to furnish dynamos having a

*Paper read before the American Electro-Platers' Society, Chicago, Ill., December 13, 1913.

†Superintendent and Electrical Engineer of Bennett-O'Connell Company, Chicago, Ill.

similar brush rigging as are used on larger dynamos and motors of a higher voltage. Then, again, it not only enables us to build a modern dynamo, but practically "fool proof" as well. It relieves the operator from the trouble and annoyance of keeping the brushes properly adjusted as well as properly lubricated. How many of you would feel a burden removed from your daily labors if you possessed a dynamo like this?

These are not all of the good features contained in modern dynamos. With the application of these brushes we are also able to give you a dynamo with a higher efficiency—one that will enable you to turn out more work per day for the reason that, regardless of the amount of work in the tank, your voltage remains constant, and at the same time you are commutating the current at the proper point of commutation, for every dynamo has a neutral point of commutation where the current can best be collected with less losses and no bad results to the commutator or brushes, whereas with the old type of dynamo, it was necessary to adjust the brushes and rheostat at nearly every change of load in order to maintain the proper voltage, but this is often neglected, which results in a light deposit or more time required to turn out the work.

In these days of sharp competition, efficiency in the dynamo as well as all other parts of the plating room is very essential. If your equipment is up to standard and your dynamo is wanting, you are still handicapped, for you will not be able to turn out the amount of work you should if you had the proper current; so if your dynamo

will give you the voltage as well as the current at a high efficiency, and with all these objectionable features removed, you have all that may be required from the dynamo end of your equipment.

There is still another improvement we have applied to our larger dynamos in what are known as "commutating poles"—sometimes called "inter poles." Commutating poles have been in use for a number of years on standard dynamos and motors of higher voltage. The writer himself has built a number of dynamos and motors equipped with commutating poles, and which were a great aid in commutation current on dynamos. These commutating poles are somewhat smaller than the main poles of the dynamos, and are placed between the main poles and wound with a series winding. These commutating poles prevent any possibility of sparking at the brushes from no load to full load, and even at a very heavy overload. They do not, however, increase the commercial efficiency of the dynamo in themselves, but by applying these commutating poles in connection with the self-lubricating and self-adjusting brushes—by properly setting these brushes at the factory, which do not require any shifting, the brushes being set at the neutral point of commutation—we are able to give you a Modern Dynamo of a higher efficiency than heretofore. With dynamos embodying all these features, we have practically reached the climax of perfection in dynamo construction for electro-plating or electro deposition of metals, which should be a source of satisfaction to the users as well as the manufacturer of plating dynamos.

THE PLACE OF THE SMELTING WORKS IN OUR MODERN FOUNDRY PRACTICE

By F. W. REIDENBACH.*

It may seem a strange title for an article, but strange as it may seem, it is nevertheless a true title. Because the smelting works has a place in modern foundry practice and more so than the modern foundries are willing to admit. For a number of years the smelter has been looked upon with suspicion; and rightly so, for the word "smelter" has been used promiscuously by every runner down of junk. And the products resulting from such practice have caused many manufacturers to become prejudiced so that the products of the smelting works are not desirable and they have set themselves against their use.

My sympathies have been with the manufacturers' interests. For a long time the competition to which they have been placed has caused them to make a great many moves to keep up the standard of quality and still stay in the field as profitable competitors. Under the circumstances they have been compelled to resort to methods of securing something cheap or cheaper than what they have been using and have resorted to the so-called "smelters" for relief, but only to find themselves even more handicapped, for what they save in cost of the metal products, they lose in foundry practice through defective castings.

The following paragraph will clearly define my meaning:

"†Today, as a rule, the furnaceman is simply a melter of scrap, a compounder of junk and any old metal that is wheeled to him. He may have charge of a number of furnaces. These may be fired in various ways. All these furnaces and their devices look alike to him; his one task is to get his charge into the pots as fast as he can,

run it down quickly, as soon as the last gate disappears, off comes the lid, up comes the pot, whisked into the trolley and rushed to the moulder, who is waiting to fill his mould and quite frequently, as some of us know, the pot of metal is sent indignantly back to him, too cold to pour, too thick, or something wrong about it. In it goes again to be soaked, oxidized by the gases of combustion, burned maybe, and out it comes again smoking hot and then it is poured. The amount of bad castings produced tells a story that needs no explanation."

This, no doubt, will explain a large amount of foundry troubles. To put it more plainly, it is the utter lack of adequate knowledge of just what is wanted and how to get it. Too many manufacturers who operate an iron foundry and machine shop think they are being imposed upon by the jobbing brass foundry and to remedy what they think is an evil (but in a large number of instances, only an imaginary one), just stick a furnace in one corner of their foundry, buy some junk, melt it, ram up a few flasks of patterns and they have a brass foundry. But it does not work, and then the trouble begins.

Now to more clearly place the smelting interest in the true position in which it belongs, let me refer again to the manufacturers knowing just what they want and then submitting the formula or specifications to a reputable smelting works, holding them to a strict account to furnish just what is called for or if not, reject the goods and hold them subject to orders. When such practice is once established a large amount of trouble will cease. This brings me to a conclusion: That the manufacturers must know, first, what they require for the different grades of work and insist upon getting what they order, for any reputable smelting works can furnish any mixture as per specifications with the usual allowance for existing impurities and the slight variation from actual formula.

*Genesee Metal Company, Rochester, N. Y.

†Quoted from The Brass Foundry of the Future, by C. P. Karr, at convention of American Institute of Metals, Chicago, October, 1913. THE METAL INDUSTRY, November, 1913.

BLACK NICKEL SOLUTIONS*

A RESUME OF THE LITERATURE RELATING TO THIS IMPORTANT FINISH.

BY OLIVER P. WATTS.†

It is not an easy matter for a man whose only connection with electro-plating has consisted in attempting to teach the elementary principles of the art to a class of college boys for two months each year, to say anything of value to a body of men who have practiced electroplating twelve months a year for many years. I fully realize this. Yet when your secretary asked me to put myself in this difficult situation, I thought only of the cordial reception you gave me a year ago, and so, unwisely perhaps, consented to address you this evening. Should my remarks consist only of what is perfectly well known to you, consider my limitations and at least credit me with good intentions.

A problem which is attracting the attention of electroplaters very widely at present is the deposition of black nickel, and I would like to confine my remarks this evening to that subject. For the past month or more, I have been carrying on a series of experiments, hoping to obtain some results which might prove of value to the practical electro-plater. While many of the results have a purely negative value, I trust that I may be able to make a few suggestions that will prove welcome.

In considering this subject at length, I have had recourse to the various books on electro-plating and files of technical periodicals which the university library has afforded, but these have not been sufficient for entirely satisfactory results. The history of the so-called black nickel solution appears to be recent; the first mention of it I have found dating back to 1889. To follow its history and to give in detail the various baths which have been proposed for use would require more time than is at our disposal this evening, but if anyone wishes this information, the paper in full will be published at some later date, and will thus be available in complete form. For our purposes, however, it will be sufficient to divide the various solutions recommended for the deposition of black nickel into three classes: First, solutions containing no nickel in their original composition or subsequent use, an arsenic compound being usually the essential constituent of the solution; second, arsenic solutions which contain nickel either put in as a nickel salt when the bath is made up or introduced during use by employing nickel anodes; third, nickel solutions which contain neither arsenic nor antimony. The last-named metal yields deposits which closely resemble those of arsenic.

To call deposits from solutions of the first class "black nickel" is a self-evident case of misbranding, which should not be tolerated by either the plating industry or the public. Solutions of the second class, whether they contain much or little nickel, will, in the speaker's opinion, yield a deposit consisting mainly, or even entirely, of metallic arsenic, whenever this element is present in the solution in any considerable amount. Both of these form a plating which is a distinct menace to health, and the use of arsenic in plating solutions should be entirely discontinued.

In attempting to trace the history of the black nickel solution from the first solution thus named to the present, I have found the following probable development. By the addition of nickel salts to some of the arsenic solutions used as dips or with the current for producing dark colors upon certain metals, the deposit was called black

nickel. Then other substances were added, and finally the arsenic was omitted, producing the true black nickel solution.

The earliest black nickel solution seems to be that described by C. H. Proctor:‡ "About eighteen years ago there was an unusual demand for antique finishes such as we find upon the market today. . . . This brought forth much experimenting among platers to produce a black deposit to be used for relief purposes in the production of this finish. The result was the black nickel solution which is used by many platers at the present time, and which gives excellent results. This formula consisted of 8 ounces double nickel salts and 4 ounces common salt to each gallon of water. This is to be worked for a short time with the electric current until it is in good condition. One to two ounces of ammonia per gallon is then added, and potassium cyanide until the precipitate is re-dissolved. One pound of arsenic and 2½ pounds of cyanide are dissolved in one-half gallon of hot water. Enough of this solution was added to the nickel bath to produce a beautiful black deposit upon polished brass, bronze, copper, or silver. . . . Nickel anodes were used." This makes the date of the first black nickel solutions about 1889. No mention of black nickel solutions occurs in books on plating by Maigne and Mathey, published in France in 1891; by Langbein, Philadelphia, in 1893; Brunor, Philadelphia, in 1894, and Watt and Philip, published in England in 1902. The several solutions which follow have been taken from such periodicals as were accessible. The composition is given both in ounces per gallon and grams per liter:

II.

	Grams.
10 ounces double sulphate of nickel...	75
2½ ounces potassium sulpho-cyanide...	19
1½ ounces copper carbonate	12
1½ ounces white arsenic.....	12

"Nickel anodes are used. The amount of arsenic in the bath determines the blackness of the deposit. The arsenic is not consumed." This is a bath of class 2, as the solutions were previously classified. I doubt the correctness of the last statement.

III.

	Grams.
8 ounces double sulphate of nickel.....	60
2 ounces potassium sulpho-cyanide.....	15
1 ounce zinc sulphate, cryst.....	7.5

Nickel anodes.

This is the first solution of class 3 that I found. The function of the zinc sulphate will be referred to later.

IV.—The Metal Industry, 1907, p. 18, C. H. Proctor.

5 ounces nickel sulphate (single)...	37.5 grams
3 ounces ammonium chloride.....	22.5 "
2½ ounces potassium sulpho-cyanide...	18.7 "
½ ounce ammonia.....	15 c.c.

"Brass anodes should be used. Some platers have proposed adding sulphate of zinc, but to do so impairs the luster of the deposit and gives it a muddy appearance. . . . In all cases the solution should be electrolyzed for some time before using." Electrolysis with brass anodes is only another method of adding the sulphates of zinc and copper.

*An address before the Chicago Branch of the American Electroplaters' Society. Banquet held in Chicago, Ill., December 13, 1913.

†Director of Laboratory of Applied Electro-Chemistry, University of Wisconsin, Madison, Wis.

‡THE METAL INDUSTRY, 1907, p. 18.

V.—The Metal Industry, 1907, p. 214.

	Grams.
1 ounce copper carbonate	7.5
½ ounce zinc carbonate	3.7
1 ounce ammonium chloride	7.5
1 ounce white arsenic	7.5
2 ounces caustic soda	15
1 ounce nickel sulphate	7.5
6 ounces potassium cyanide.....	45

Sheet brass anodes were used. It is a safe prediction that the deposit from this solution will consist mainly of metallic arsenic.

VI.—A Soft Black Nickel.

- 4 pounds sal. soda
- 1 pint ammonia saturated with nickel carbonate
- 2 ounces ammonia saturated with zinc carbonate
- 1 ounce ammonia saturated with copper carbonate

Anodes of nickel, iron, or carbon. One to 3 volts is preferable, although 4 to 5 volts may be used.

VII.—The Metal Industry, 1909, p. 2.

	Grams
12 ounces double sulphate of nickel....	90
2 ounces white arsenic	15
2 ounces ammonium carbonate	15
1 pound conc. ammonia.....	120
Potassium cyanide to clear.	

Nickel anodes are used, and the solution is said to give a deposit that is black, not gray, and which will not fade or tarnish. Lacquering is hardly necessary. The solution stands at 8 to 9 degs. Bé, and is run at 2 to 4 volts.

VIII.—The Metal Industry, 1911, p. 313.

- 1 gallon hot conc. muriatic acid.....1,000 c.c.
- 2 pounds white arsenic..... 240 grams
- 4 ounces nickel sulphate..... 30 "
- ½ ounce copper sulphate..... 4 "

Use Nickel anodes and a weak current.

IX.—The Metal Industry, 1912, p. 88.

- 6 ounces double sulphate of nickel
- 4 ounces ammonium chloride
- 1 ounce nickel sulphate
- 2 ounces potassium sulpho-cyanide
- 1 teaspoonful of a solution consisting of 1 part copper carbonate in 2 parts ammonia. Brass anodes.

A. Brochet,² speaking of black nickel, says, "It seems to consist of a deposit of nickel and carbon, and could probably be replaced by a deposit of another metal brought about under similar conditions. A deposit of black nickel is easily obtained by diluting an old bath to a fourth its strength and adding for each liter 50 grams of ammonia and 50 grams of a hyposulphate. The latter can be replaced by a neutral sulphite, or bisulphite, or a little potassium cyanide."

It was found impossible to include all published black nickel solutions without unduly extending this paper, but it is hoped that the solutions selected are fairly representative of practice. Their chronological arrangement should indicate what progress, if any, has been made, and whether or not any solution has been adopted as standard.

Arsenic is present in solutions 1, 2, 5, 7, 8.

A sulpho-cyanide is present in solutions 2, 3, 4, 9.

Copper is a constituent of 2, 5, 6, 8, 9.

Zinc is a constituent of 3, 5, 6.

The use of brass anodes puts copper and zinc into 4, 5, 9.

Nickel anodes are specified for 2, 3, 7, 8.

The presence of copper or zinc in many of the above solutions is for the production of a darker deposit than is obtained in their absence. If the solutions given above are representative of actual practice it is evident that there is as yet no real standard black nickel. A finish

so-called may be arsenic, or a mixture of arsenic with nickel, copper or zinc; or with one or more of their sulphides; it may consist of nickel sulphide, or a mixture of the sulphides of nickel, copper and zinc; or it may consist of still other substances.

For the past month the speaker has been working overtime to render this confused state of affairs even worse confounded, by trying to discover a lot of new solutions which would yield black finishes containing other metals than nickel. These experiments will be briefly described.

On the assumption that the true black nickel deposit consists of nickel sulphide, it appeared possible that any metal whose sulphide is black might yield a satisfactory deposit. The sulphides of the following metals are black or very dark in color: Bismuth, cobalt, copper, iron, lead, mercury, nickel, silver, and tin. Having once tried to do silver plating from an old photographic fixing bath and obtaining a black deposit of silver sulphide instead of the white silver desired, I now decided to try sodium hyposulphite as a substance likely to yield sulphur under the influence of the electric current.

Salts of various metals were dissolved in a solution of "hypo" containing 60 grams per liter. Current densities are expressed in amperes per square foot.

Exp. 1. 25 grams of tin chloride per liter. At 3 amperes per square foot, this gave a dark smut on copper, which easily rubbed off.

Exp. 2. The double sulphate of nickel used similarly, gave a deposit of white nickel.

Exp. 3. On adding 25 grams lead acetate to the previous solution a good dark gray deposit was obtained, which took a fine polish. Temperature 140 degs. F. (60 degs. C.). Current density 1 ampere.

Exp. 4. Lead acetate, 25 grams per liter, gave a dark, poor deposit, mainly metallic lead.

Exp. 5. Copper sulphate, 35 grams, gave only a yellowish tarnish, at current densities of 1½, 3 and 4½ amperes. Made alkaline by ammonia it gives a black smut at high current density.

Exp. 6. An old photographic fixing bath gave a dark brown, but non-adherent deposit. A lacquered sample is shown.

This series of experiments with hyposulphites of the metals proved a disappointment, the only one that gave promising results being the combination of nickel and lead salts.

A new series of experiments was then tried with sulphocyanides of a number of metals. According to Comey's Dictionary of Solubilities, the sulphocyanides of bismuth, copper, lead, mercury, and silver are insoluble in water, while those of cobalt, iron, and nickel are readily soluble, and that of zinc slightly soluble in water.

Exp. 7. Although bismuth sulphocyanide is insoluble in water, it is soluble in nitric acid, and a solution was prepared by adding ammonium sulphocyanide to an acidified solution of bismuth nitrate. This solution produced a heavy black deposit on copper without the use of the current, but it was rubbed off by the finger. On platinum the current gave a dark brown deposit which rubbed off rather easily. After adding citric acid to the solution it is possible to neutralize it by ammonia without causing precipitation of the bismuth. This solution does not blacken copper on immersion, and the current produces a deposit that adheres slightly better than the first.

Exp. 8. Ammonium sulphocyanide was added to a solution of cobalt nitrate, and in one-half hour a good deposit was obtained, about as dark as the black nickel deposit when the special blacking agents are not added. A sample is shown.

Exp. 9. Although copper sulphocyanide is insoluble in water it is soluble in ammonia or in a solution of am-

²Manuel pratique de galvanoplastie, p. 257. Pub. Paris, 1908.

monium sulphocyanide. Twenty-five grams of ammonium sulphocyanide and 60 grams of copper sulphate per liter, containing much undissolved copper sulphocyanide, gave no deposit. More ammonium sulphocyanide was added with a like result. Finally enough ammonia was added to clear the solution, and still no deposit was obtained by the current.

Exp. 10. A solution of 50 grams ferrous ammonium sulphate and 25 grams ammonium sulphocyanide per liter, at $1\frac{1}{2}$ amperes per square foot gave a dark gray deposit. The addition of 10 grams zinc sulphate caused the deposit to become a fine black, which takes a good polish. This is equal to black nickel in appearance, but the solution is an unsatisfactory one to work on account of the formation of iron rust, and the frequent failure of the deposit to cover completely. Iron anodes were used. A sample is shown.

A similar solution of ferric chloride was tried, but this corroded both copper and nickel so rapidly that it is unsatisfactory. The color of the deposit was excellent.

Having been unsuccessful in attempts to prepare a black nickel solution from published formulas, in 1908 the speaker purchased a solution already prepared from one of the plater's supply houses.

Its composition was 8 ounces double sulphate of ..
 nickel 60 grams
 1 pint ammonia 125 c.c.
 3 ounces potassium sulpho-cyanide..... 22 grams
 2 ounces white arsenic..... 15 "
 3 ounces ammonium carbonate..... 22 "
 6 to 9 ounces potassium cyanide..... 45 to 67 "
 1 gallon water 100 c.c.

Several deposits at $\frac{1}{2}$ ampere per square foot were made on platinum. An analysis of one of these by Mr. W. G. Crawford, of the Department of Chemistry, showed that it contained 91.2 per cent. arsenic, and 8.3 per cent. nickel. It contained no sulphur.

It seemed of interest to determine the current efficiency of some of the black nickel solutions.

From the solution last mentioned 0.902 gram per am-

pere hour was deposited, a current efficiency of 95.7 per cent, calculated for the composition found by analysis. Faraday's law requires 0.9324 gram of arsenic, and 1.095 grams of nickel per ampere hour.

EXP. 11. BLACK NICKEL ON ALUMINUM.

Having experienced the usual difficulties when trying to plate aluminum with other metals, the speaker was not surprised to find the following statement twice repeated in one of the plating trade journals³, in answer to questions from correspondents, "There is no method of blackening aluminum by the use of a solution or by plating that is satisfactory." You can imagine my delight at obtaining firmly adherent deposits of black nickel upon aluminum from solution No. 3. The deposition is carried out just as for any other metal, and the coating seems to adhere quite as well as upon copper or nickel. The samples exhibited were prepared too recently to be certain that time will not cause the deposit to peel off, as has happened in the case of many previous deposits upon aluminum, but so far there is no sign of peeling. The color is as yet unsatisfactory, being of a brownish tone. This is probably due to its being deposited over a matte instead of a polished surface, as all attempts to clean the aluminum without destroying the polish, have failed. Experiments are, however, being continued, and suggestions along this line will be welcome.

The trouble frequently reported in basket plating of small objects with black nickel can be overcome more simply than by the suggested remedy of coppering the basket after each batch of work, provided the use of aluminum baskets is permissible. Aluminum is used for dipping baskets. Could it not also be employed for plating baskets? In this case it is only necessary to dip the basket a few seconds in a mixture of equal volumes of nitric and sulphuric acids, diluted with water to any degree which suits the operator. The nickel sulphide is quickly removed and the aluminum is not attacked by the acid.

³Brass World, 1911, p. 335; 1912, p. 411.

THE ARTIFICIAL PRODUCTION OF COLORS ON METAL *

SOME PRACTICAL SUGGESTIONS FOR OBTAINING POPULAR FINISHES.

By H. E. WILLMORE.

Among the various duties the electro-plater is called upon to perform none is more interesting than that of the coloring of metals, be they solid or deposited; and I will endeavor to present the details of a few of the methods in use for producing the artificial coloring of some of them. I shall confine myself in this article to the coloring only of copper and brass and to the use of chemicals that can be easily and cheaply procured. No especial claim is made to originality of the subject matter. Let it be further stated that its contents are from my own personal experience, and the formulas given are such as I have used repeatedly with satisfactory results for producing metal finishes. While any of the dips can be used on solid metal, they are not applicable to brass or copper-plated iron or steel unless the deposit is very heavy.

The coloring of metals has been called by various names, among them "oxidizing," "bronzing," "staining," etc., but is more commonly known as "oxidizing." As oxygen has very little effect on some of the metals, this is incorrect; but, since this is the term universally used to designate the coloring of metals, I have thought it advisable to use it in that sense throughout this paper. Whatever the term or methods used, the object is to

impart by chemical agents an artistic or antique appearance to the surface of metals, which produces an effect of contrast, enhances its beauty, and makes it pleasing to the eye.

Many metals when passed through certain chemical solutions assume a variety of colors due to the formation of films of oxides or sulphides upon their surfaces, the quality of the color depending to a great extent upon its depth and the method of its formation. In all metal coloring processes, temperature, time of immersion and concentration of the solution used exert considerable influence on the results obtained, and frequently it will be found necessary to repeat operations to produce desired results. There are many other little items that make for success which require a care and attention in operating that experience alone can impart. No formula for metal coloring, however simple, is of any value without intelligent manipulation.

While the coloring of metals presents no serious difficulties, many failures can be attributed to the improper preparation of work before its immersion in the coloring bath. Perfect cleanliness is therefore an important factor in obtaining the best possible final results.

Some of the metals are more susceptible to the coloring process than are others. Copper, for instance, forms the basis for a larger variety of colors than any other metal.

*Address at Banquet American Electro-Platers Society, Chicago branch, Chicago, Ill., December 13, 1913.

These are known chiefly as "oxidized," "antique" and "old copper," most of which are obtained from the potassium sulphide solution of greater or less concentration. This solution is capable of producing a number of shades, from very light tints to jet black on copper, all finishes with which most platers are familiar. In producing the "statuary bronze" finish, which, according to taste may be light or dark, I prefer that the solution contains not more than 2 ozs. of the liver of sulphur to the gallon of water, used cold and scratch-brushed with a wet wheel, as this gives a more even finish than when a dry brush is used. "Mahogany bronze" is produced in the same manner, but should have only a momentary immersion in the dip. The lighter shades, when relieved with wet powdered pumice, give soft and pleasing contrasts. For producing darker tones the dip can contain 3 ozs. of the sulphide to a gallon of water, with the addition of a little aqua ammonia. If, however, the solution is too strong, the work will present a smoky appearance and the firm adheres badly, sometimes flaking off from the article treated. These dark shades, after drying, are scratch-brushed with a steel wheel and relieved or "spotted" on a rag buff, except in the case of sand blasted goods. This operation is best performed with wet pumice powder applied to the scratch-brush. On some kinds of work I have used the pumice moistened with kerosene oil, afterwards washing in benzine and drying in sawdust. This method will be found desirable when it is not advisable to put the article in water, on account of the porosity of the metal, after it has been thoroughly dried out before the relieving operation.

Heavily coppered articles can be given a brown finish known as "French bronze" by immersion in a solution, maintained at the boiling point, containing 3 lbs. copper sulphate in 1 gallon of water and adding 1 oz. of caustic soda first dissolved in a small quantity of water. This dip requires careful watching. The work should be kept in motion during immersion and withdrawn occasionally for inspection as the coloring proceeds. When taken from the solution it must be well rinsed in water, dried and scratch-brushed with a well-worn brass wheel, which gives it a very high lustre.

Other brown colors are obtained on copper by using barium sulphide $\frac{1}{2}$ oz., water 1 gallon, used warm; or ammonium chloride 3 ozs., potassium sulphide 1 oz., cold water 1 gallon. A purple shade is given to copper by dissolving in 1 gallon of hot water sodium hyposulphate 8 ozs., with the addition of $\frac{1}{2}$ oz. nitric acid. Scratch-brush with a wet wheel before and after immersion, dry in hot water and sawdust. The color of copper is deepened to a bright red with copper sulphate 2 lbs., common salt 2 lbs., hot water 1 gallon, going through the same operations as for the previous finish. "Royal copper" is produced on solid copper or heavily plated goods by first coating with lead by the electrolytic method and then bringing to a red heat by means of the blowpipe or torch. It is not possible to apply this finish to plated white metal or soldered articles. This finish is brought to a high lustre by means of a cotton buff. Another method of producing this finish is to dip the copper or copper plated articles in nitrate of potash contained in an iron kettle and brought to a high temperature. The reddish bronze color seen on medals is produced by this method after they have been sand blasted and coppered in an acid copper solution.

As brass is not always of the same composition, it will be found that shades will differ, as the alloy contains more or less zinc or other foreign metals. Sheet metal will also obtain different shades from that of the cast article when passed through the same dip. It is for this reason that difficulty is experienced in producing dupli-

cate shades on a variety of brass articles, even when their composition differs but slightly. Taking for a standard solution $1\frac{1}{2}$ ozs. of the yellow sulphide of antimony, 6 ozs. caustic soda, and 1 gallon of water, any shade of brown can be produced on brass, from the light yellowish to a dark seal or chocolate color, by varying the concentration of the solution, changing its temperature, or regulating the duration of time work is in contact with it. These things have an important influence on results which can only be determined by practice. After coming from the dip, the work should be thoroughly dried and scratch-brushed. It will present an altogether different appearance after this operation has been performed. If it is too light in color, it can be returned to the dip until the desired shade is produced. It also makes a difference in the color as to whether the work enters the dip in a highly polished condition, scoured with wet pumice, or sand blasted.

Another solution for producing brown shades on brass consists of potassium chlorate $2\frac{1}{2}$ ozs., copper sulphate $2\frac{1}{2}$ ozs., water 1 gallon and used at a temperature of about 175 degs. F. As the article comes from this solution, it has a greenish brown sheen; but when dry scratch-brushed, is of an even cinnamon-brown color. Brass can also be colored brown by adding potassium sulphide to a solution of sodium hydrate in the following proportions: potassium sulphide 2 ozs., caustic soda 8 ozs., water 1 gallon. The shades of color depend on the temperature at which the solution is maintained. A solution containing potassium sulphide alone gives no useful results on brass. There are several other dips that could be mentioned, but I think these will be found sufficient to produce any shade of brown desirable.

Brass will assume a red color by treatment with copper nitrate 8 ozs., oxalic acid 8 ozs., hot water 1 gallon. It can be given a blue color with a boiling solution of lead acetate 3 ozs., hyposulphate of soda 4 ozs., in 1 gallon of water. Iridescent colors of red, brown and green are obtained by substituting sulphuric acid for the lead salt.

The means of coloring brass black are many and varied, probably the most useful being the black nickel solution, as it does not require the attention some of the dips claim, although the dips are more desirable when small articles are to be blackened in bulk by means of baskets. For a jet black color, ammonia and copper carbonate is more generally used. This consists of ammonia with copper carbonate added until the solution is thoroughly saturated and a little remains at the bottom of the container in the form of a black oxide. Water may be added in a small amount to reduce the strong fumes of ammonia. This dip will work satisfactorily only when kept at a high temperature. Arsenic enters largely into the composition of dips for coloring brass black, used either electrically or by simple immersion.

Never in the history of metal coloring have there been as many finishes as can be found on the market today. It is to be desired that some time in the near future there will be a national standard designation for metal finishes to prevent the confusion that is now created by each manufacturer's having an individual name for the finishes on his product. In accepting a new position where metal coloring is performed, the plater will be requested to finish some of the work in "antique copper" or "old brass." The name means nothing to him, for in a previous position they may have been called "oxidized copper" or "old copper," or "oxidized," "antique," or "flemish" brass. Any of these may represent a number of finishes with their great variety of relievings and shadings. A customer under present conditions is also at a loss to know by what name he shall ask for the finish he requires when making his purchase.

WHAT IS "BRASS"?

AN ARTICLE DEALING WITH SOME TROUBLES OF METAL MANUFACTURERS.

By W. H. PARRY.*

Competition, they say, is the life of trade, and between push cart peddlers the practice is observed to the letter, but in the brass foundry business it does not apply as competition, and if something is not done, it will mean the death of trade. The stunts they pull off these days in the making of so-called brass castings is little short of criminal.

Not so very long ago a contract was let to the lowest bidder for a brass casting for the bottom section of a 16-foot vacuum pan, used in the boiling of sugar. The specifications called for a "four element" brass. The casting was delivered in due course of time and the machining operations were started. When we say started we mean just that much and no more, as it was found that no tool would stand up to the work. The so-called brass being so hard that not one of the many kinds of the high speed steels would touch it, and as the casting weighed over three tons, it meant that the handling of it alone ran into some big money.

The brass founder was called upon to explain what the trouble was with the materials used in the making, and he said that he had used just the right proportions with allowance made for his spelter loss. There was nothing left to do but to take some drillings and have them analyzed. This was done at the expense of several high speed drills that "worried" enough of the metal from the casting to make a sample large enough for the chemist to test. The result of the analysis was most eagerly awaited, particularly by the founder and, would you believe it, the four elements as specified showed up as close as could reasonably be expected. The founder immediately suffered from inflation of the chest and considered his part of the contract filled and refused point blank to entertain any proposition that would entail the making of another casting. In a measure he was right, but only in a measure, as when an expert chemist was called in to settle the matter, at least to the satisfaction of the firm who ordered the casting, it developed that the casting had been made from metal melted in a cupola and had "lapped up" enough impurities and other elements that the chemist never dreamt of to make the casting as hard as the rim of a carwheel. We will not attempt to enumerate here what the other elements were, as the final analysis showed about everything that is dug from the earth in the shape of metals, except platinum, gold and silver.

The final outcome of the matter was that the same foundryman made the second casting, but he did not use a cupola, and they gave him sixteen cents a pound instead of twelve, which was the figure named for the first casting. This would indicate that anybody looking for honest brass at twelve cents per pound even in a casting weighing three tons has "something coming to him."

In one manufacturing foundry not over a hundred miles from the New York City Hall, during a wave of economy instigated and abetted by the purchasing agent connected with the company, ingot composition was purchased in huge quantities and to a certain specification. While the ingots appeared to be all that could be expected for the money paid for them, the "joker in the pack" showed up in the first batch of castings. Though they poured all right and had a beautiful golden hue, when the castings were cold every gate that was eventually sawed off stripped the teeth off the band saw blades about, but not quite, as fast as they could be mounted on

the machines. Well, as it was not the desire of this company to boost the "saw trust" at their own expense, they stopped using the ingots. Pending an analysis of their elements nothing was found out of kilter, so nothing was left to do but use these ingots; though to sever the gates from the castings a sprue cutting machine was used. No matter how the melter tried to "doctor" the stuff, it would still tear the teeth out of the band saw blades, although the castings could be machined without difficulty in the machine shop. Now what was the matter with these ingots? The three samples that were analyzed at three separate periods and from three widely separated portions of the piles, showed nothing wrong, and yet there was something radically wrong with them when the gates would rip off the teeth of the band saw blades. The explanation of the melter's assistant did have originality at least, when he stated that in his opinion "the ingots were full of alum and became puckered with the heat."

The manganese and aluminum bronzes and brasses that have cropped up these last few years, particularly for use on automobiles, are responsible in a large measure for a lot of the bad brasses made today. The more so on "pressure work," as a very small percentage of either in the scrap will produce castings that are unreliable and as more and more "gasoline wagons" reach the scrap heap and (believe us, that's where the most of them ought to have been placed when new), it follows that founders who want to keep their good name had better fight shy of these materials even if the temptation on the score of cheapness is hard to resist.

THE MOLDING MACHINE DEMONSTRATOR.

Oh! keep your eye on the Demonstrator,
When to foundry shows you go.
For he "flashes" speed even greater,
Than Lake Michigan winds do blow.

Fifty molds an hour is his gait,
Which is anything but an output slim.
Though if you bite on his tempting bait
You'd need fifty more "Just like him,"

To produce the large and juicy floors,
What are seen only at such shows.
And it would need about all outdoors,
To store and pour the work "and his" blows.

But he's fooling you, old man,
As you'll never ram the flasks in your plant,
That this molding machine man can,
As his spells last but five minutes scant.

'Cause why, says Cockney Bill the Crab,
'E honly works a short spell at a toime,
Then loafs an hour, the bleeding scab!
Whilst by working alwise, we gets the bloime.

And Cockney Bill's claim is pretty nifty,
As is that of the molding machine man,
So split their production figures "fifty-fifty,"
As a basis for your output plan.

—W. H. PARRY.

(Although we consider prose to be Mr. Parry's forte, we publish the above as an example of his poetical humor, and we shall be glad to hear from the "demonstrator" in prose or poetry.—Ed.)

*Superintendent National Meter Company, Brooklyn, N. Y.



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EDITORIAL

THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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THE METAL INDUSTRY FOR 1914

THE METAL INDUSTRY throughout the eleven years of its life has aimed to be a paper of authority in its chosen field; that of the founding, working or machining, finishing and the application of the metals other than iron and steel. The policy of the paper has been and is to publish articles on various subjects by the best writers obtainable and to select only such material that will be an aid and guide to its readers. How well the paper has succeeded in its aims is known only to those who have thoughtfully and carefully read its columns. The matter contained in this issue, the quality of which may be noted by reading the contents given on this page, may be taken as an index of what we propose to furnish for the coming year. We trust that it will meet with the approval of our many readers. In any event we express our feeling in the matter by quoting the familiar saying, "If you like us tell your friends, if you do not, tell us." This is just what we would like to have practiced upon us. If any of our readers have any suggestions which will aid us in preparing a better and more complete trade paper we will be very glad to hear from them. Any suggestions or ideas for articles that would prove interesting to a number of readers will be heartily welcomed and arrangements made for carrying them out. Any reader having a problem relating to the alloying, casting, molding, plating and finishing, in fact ANYTHING relating to the metals, is urged to consult us and we will try to give him a simple and accurate solution and without charge, provided that no chemical analyses are necessary for such solution.

Last January THE METAL INDUSTRY announced a prize for the greatest progress made in plating, founding and machine shop practice. There were articles submitted during the year in competition only in plating, and this prize was awarded to Franklin W. Hobbs, of Bangor, Me., for his article on "THE FILTERING, AGITATING AND HEATING OF NICKEL PLATING SOLUTIONS" in the August number of THE METAL INDUSTRY. It has been decided to repeat this offer for 1914; the character of the prizes will be announced later.

The manner of competing for such a prize will be extremely simple. All that is necessary will be to recount what has been done, describe a process and furnish photographs of a machine or apparatus. All matter that is considered good enough to publish will be paid for at regular rates and any one ACTIVELY connected with molding, plating or finishing and machining can compete.

THE METAL INDUSTRY hopes to be able to award more than one prize for 1914!

RETROSPECTIVE REVIEW OF 1913—OUTLOOK FOR 1914

A BRIEF REPORT OF BUSINESS CONDITIONS EXISTING IN THE METAL INDUSTRY FOR THE PAST YEAR. PROSPECTS FOR 1914, AND PASSING NOTICE OF SOME OF THE MORE NOTABLE BUSINESS EVENTS AND NEW LABOR-SAVING DEVICES AND METHODS.

The year 1913 has been one of promise and disappointment. The close of 1912 left the business world in a state of expectation for better things. There was a perceptible awakening in all lines of the metal industry and an attitude of being ready for big business was plainly evident. The first few months of 1913 seemed to warrant such feeling, but the period of prosperity was short lived. After a few short spurts business fell off and a dense cloak of commercial apathy settled down on the shoulders of the industrial world. During last spring, before the passing of the tariff law, the reasons assigned for the commercial unrest were of course the advent of the new administration, the attitude of the Government toward the trusts and the tariff revision. But however great these influences may have been, no one seems to be able to put a finger on one actual cause of the general depression. There has existed a general contraction of money and credit and consequently of business which has been going on for some months all over the commercial world and of the accompanying general feeling of distrust of the future. This latter feeling is well reflected in the fact that the bond and stock market has been very active the last few months. Solid investment has been the order of the day, and speculative and venturesome propositions have had rather a lean year. Since the latter part of November, 1913, there has been a slight reaction in business which is steady and which bids fair to continue and to increase with a hope of a return before spring to normal conditions. The reports from our correspondents in the various metal trade centers of the United States published in the *TRADE NEWS* columns of this issue of *THE METAL INDUSTRY*, indicate this. Concerns of all kinds speak hopefully and enthusiastically of the outlook and of their plans for 1914.

The automobile business has become to the metal trades what the steel and railroad business has long been to general trade—an index of industrial conditions. When the demand for automobiles is on the increase, the business of the metal founder and finisher supplying the parts and accessories waxes fat, and this is one reason why these latter lines of business have not complained very much about poor business. Judging from the interest shown at the Fourteenth Annual Automobile Show held last week at the Grand Central Palace in New York City there will be no lagging in the automobile trade the coming year. There are now estimated to be 1,000,000 automobiles in use in the United States and probably very nearly this number will be turned out in 1914, so there should be no lack of business for the supply and parts manufacturer during the coming year. One indication of the permanency and solidity of the automobile business with its attendant influence on the metal and kindred trades is the recent announcement of the Ford

Motor Company that it will build 400,000 cars for 1914. This company has also announced that it will inaugurate a profit sharing plan by means of which it will distribute \$10,000,000 during the coming year.

GROWTH OF SCIENTIFIC MANAGEMENT.

One of the prominent developments of the year 1913 has been the interest taken in scientific management. Some of the largest manufacturing concerns have taken up the matter and have discovered that it was not merely the newfangled idea that they had supposed it was, but really a carrying out of common-sense ideas which in a great many cases they already had partially developed in their own works. Scientific management does not consist in simply hiring an expert accountant to come into a factory and compute the cost of the production of its wares. It means that every detail of a business must be gone into with the view of reducing the cost of production and simultaneous reduction of overhead and selling expense. The more general understanding of the meaning and application of scientific management has undoubtedly enabled many concerns to preserve their corporate existence during the past year.

THE TARIFF BILL.

The Underwood-Simmons tariff bill, the bugbear of business for nearly a year, was finally passed in May, 1913, and while it is of course too early to note any direct results, there are at hand some indications of its workings. The new bill reduced the duty on many of the metals produced in this country, and this has already stimulated the metal trade, the most noticeable of which perhaps is aluminum. The developments in this metal have been large and it looks as though in a few months there will be more than one producer in the United States. The Southern Aluminum Company, who have equipped a large plant at Whitney, North Carolina, we are told will soon be producing aluminum. The plant has a capacity of 25,000 pounds per year and from reports the indications are that the size of the plant will have to be doubled in order to supply the demand that is in evidence. The Aluminum Company of America will increase its output with the building of an enormous new plant at Maryville, Tenn.

The removal and lowering of the duty on some kinds of heavy machinery has resulted in the establishing in this country offices by several prominent German machinery manufacturers for the introduction of rolling mill machinery, some of which was described in *THE METAL INDUSTRY* December, 1913, under the head of *SCRAP BUNDLING MACHINES*. We have no doubt but that these companies are the forerunners of others, and we will be interested to watch the outcome for American metal working machinery has been freely bought and used abroad for some time, so now it remains to be

seen if the foreigner can match the ingenuity of the Yankee manufacturer with a product of cheaper labor.

SOCIETIES AND ASSOCIATIONS IN 1913.

The various societies directly connected with the foundry and metal trades have all been very busy throughout the year and a great deal of good work has been done. The literature emanating from these bodies is prodigious in quantity and it is becoming more and more easy for any one interested in any line to get scientific aid in solving his problems by turning to the transactions of the particular society devoted to his trade. The American Society for Testing Materials, which conducted the sixth Congress of the International Society in 1912, has issued all told over 5,000 pages of matter relating to the proceedings of the Congress, some of it printed in four languages. The American Electro-Chemical Society issued its report of its deliberations for the year in a 432 page volume. Included in this book is the collection of matter on electro-plating, which was presented at its symposium held in Atlantic City in April, 1913, in conjunction with the American Electro-Platers' Society. This symposium covered the electro-deposition of the metals gold, silver, lead, tin, nickel and copper and the information set forth in the papers presented in the transactions for 1913 are extremely valuable, as they comprise a résumé of references to *all* the matter ever published or printed on the subject of electro-deposition.

The American Electro-Platers' Society has been extremely active and have made a large gain in membership. This society, which was started as the National Electro-Platers' Association of the United States and Canada, has now 13 branch societies all in flourishing condition. These branches are located in New York, Newark, N. J., Philadelphia, Pa., Milwaukee, Wis., Chicago, Ill., Rochester, N. Y., Detroit, Mich., St. Louis, Mo., Dayton, Ohio, Cincinnati, Ohio, Indianapolis, Ind., Buffalo, N. Y., and Toronto, Canada. When one realizes that each of these branches holds a meeting once and sometimes twice each month, it will be seen that there is a meeting of platers seventeen days every month all over the country! "Truly, the plater has come out of his shell!" An account of the second annual banquet of the Chicago branch held December, 1913, is given in this issue of *THE METAL INDUSTRY*. The American Electro-Platers' Society is now on a firm and solid foundation and has successfully weathered some dangerous storms which threatened to wreck its young life. A little more expansion to its membership requirements and it will have no difficulty in ranking very soon with the oldest and largest of the technical societies.

The convention of the Allied Foundrymen's Association held in connection with the exhibition of the Foundry and Machine Exhibition Company in Chicago in October, 1913, was as usual the foundry event of the year. This convention was fully described in the October and November issues of *THE METAL INDUSTRY*. The American Institute of Metals accomplished a lot of work last year principally in committee, and therefore not yet published. This society in conjunction with the Bureau of Standards

at Washington, D. C., is working to formulate standard methods of analysis of copper alloys. The Bureau has finally decided to prepare its own samples and this work is now being done at an experimental foundry in Pittsburgh under the direction of the Bureau by C. P. Karr. The Bureau of Mines is also co-operating with the American Institute of Metals to determine a standard metal melting furnace and also a suitable form of commercial pyrometer. This work is being carried on by H. W. Gillet under the direction of Dr. C. H. Parsons. Other work in hand by the Institute of Metals is a method for standardizing the sizes and marking of graphite crucibles, and a revision of the nomenclature of metals. The sister society, the Institute of Metals of Great Britain, had a very successful year and have issued Vol. IX and X of the proceedings, a work of 811 pages, which contains among other interesting papers the report of the Condenser Tube Corrosion Committee, an abstract of which was published in *THE METAL INDUSTRY* September, 1913.

NEW APPARATUS—METHODS AND PROCESSES.

We have not had nearly as many new things relating to metals in 1913 as we had in 1911 or 12. One very interesting development, however, was the invention of a machine for tinning metal on one or both sides as may be desired at the rate of 100 feet per minute. This machine, described in *THE METAL INDUSTRY* for September, 1913, will, we believe, work a revolution in the manufacture of sheet copper and brass for all purposes, such as boilers, cooking utensils and household articles where tin is used as a protective coating. Another interesting machine was described in the December issue of *THE METAL INDUSTRY* and is for the rapid "overhauling" or scraping the surface of metals. This machine scrapes BOTH sides of a metal bar at once and works very rapidly. This is a great advance on the present process of scraping first one side and then the other, and only a small portion of each side at a time.

Among the metal finishing devices brought out during the year probably polishing and grinding lathes and sand blast machinery show the greatest advance. No fewer than seven distinct makes of sand blast machines were described in *THE METAL INDUSTRY* for last year. In the electro-plating line dynamos and mechanical platers have made great progress and a number of these have been noticed during the year. The inventors have been busy during the year, 127 patents having been described in *THE METAL INDUSTRY*, furnaces of various kinds leading off with eleven and alloy mixtures a close second.

NEWS OF THE WORKS.

The rolling mills and foundries of the country have held their own and there has not been anything unusual to report. Toward the last of the year many of the larger plants making brass and copper were forced to five days a week with reduced forces, but reports now indicate an early resumption of normal schedules. There have been no new mills projected or started, and only a few additions to the old ones. The American Brass Company have moved into their new office in Waterbury, Conn.,

a picture of which is shown in this issue of THE METAL INDUSTRY, and a new casting shop is said to be projected by the same company at their Coe Brass Branch at Torrington, Conn. The Lumen Bearing Company of Buffalo, N. Y., have completed their additions and are occupying them as is told in the story in this issue. The Canadian plant at Sarnia, Ontario, Canada, described in the March number of THE METAL INDUSTRY of the H. Mueller Manufacturing Company, is now running at full capacity and reports business good.

OUTLOOK FOR 1914.

Taking it all in all the year of 1913 did not leave any trail of great disasters or misfortune behind it. There are some, no doubt, sorry to see it go, for they are a year older, but the vast majority rushing on at a great pace is anxiously waiting for new machines, methods and processes so that the old may be discarded like the spent hours. What 1914 has in store for us no one can tell, but we know that the country is ready to solve any problem that may be put to it.



MELTING POINTS OF ALLOYS

To the Editor of THE METAL INDUSTRY:

On page 516 of your December, 1913, issue, following the paper by Mr. Norton and myself on "Approximate Melting Points of Some Commercial Copper Alloys," is given a discussion contributed by C. P. Karr, and a statement that my answer was not available at the time of publication.

Mr. Karr's discussion, presented at the 1913 meeting of the American Institute of Metals, was answered at that meeting. The tone of Mr. Karr's comments, now repeated in your journal, makes it seem advisable to answer them there also.

I plead not guilty as to intention to discredit Mr. Karr's work, not guilty of misquotation, but perhaps guilty of too loose a wording in regard to Longmuir's figures.

Taking up his points in order, Mr. Karr himself said (Trans. Am. Inst. Metals, vol. 5, pp. 79-80) that he got a melting point of 1,640 degs. F. (about 895 degs. C.) for 68.5 Cu, 0.19 Pb, balance Zn, "but on account of the heavy oxidation of the surface it is believed that this reading may be somewhat too low, particularly as the melting point of a brass containing 70 per cent. Cu and 30 per cent. Zn was established at about 950 degs. C. (1,742 degs. F.) by Haycock and Neville." I took this as a confession of inaccuracy. I would not have been justified in quoting his figure without some reference to its probable lack of accuracy, after such a statement by the experimenter himself. His contention that the melting point of a 70:30 brass would not be lowered 10 degs. C. by 2.3 per cent. Pb., may rest unanswered till some proof is adduced. In the table on page 78 of volume 5, Am. Inst. Metals, Karr gives under the heading of "melting point," 1,650 degs. F. (900 degs. C.) for his No. 2 alloy, and for this alloy under the heading "approximate copper constituent," he gives 84. Therefore, he did make the statement as quoted by me.

As to his gun metal not containing zinc, he says on page 83, "No. 4 metal corresponds to Longmuir's gun metal"; on page 87 he says, "most of the metals tested were high-grade bronzes with hardly any zinc in at all. No. 4 had no zinc in at all." On page 80 he says, "An independent reading of the No. 4 metal . . . showed a melting point of 1,850 degs. F. (1,010 degs. C.)" Since this figure agrees fairly well with our determination, and Karr now says this was the only one taken under approximate black body conditions, it would seem reasonable that his other determinations, not taken under such conditions, were really low, as they appear to be by comparison with our figures. The question as to analysis is futile, as we naturally did not have his sample, and took his own statement as to zinc content, which he now contradicts.

The words "all cases" in regard to Longmuir's work might perhaps better have been "all cases cited below," as they were meant to refer only to the figures quoted and not to other castings Longmuir made. There was no desire to discredit Longmuir's work. These figures were not intended by Longmuir as determinations of the melting point, and hence he would lay

no claim to their accuracy for that purpose, but as they were figures on metal poured very cold; they were quoted by us as giving some idea of the melting point region. Our statement in regard to the figures quoted was accurate; to make it out inaccurate, one has to read into our paper a reference to Longmuir's other castings, for no such reference was made.

We took no tensile tests and made no reference to any relation between melting point and pouring temperature, because we were not studying those subjects nor writing a paper on them.

An alloy has the same melting point whether melted in the foundry or the laboratory, in one ounce or in 10-ton lots, hence, I fail to see why I should have duplicated Mr. Karr's conditions, as to quantity of metal, etc.

I submit the above in justice to Mr. Karr as well as to myself, since, as he seemed satisfied by my answer at the Chicago meeting, I do not believe that he would wish his discussion, which charges me with wilfully making misleading quotations from his paper, to receive wide publicity in THE METAL INDUSTRY, without some reply, after I had shown that my quotations were true ones.

H. W. GILLET.

Ithaca, N. Y., December 18, 1913.

SPOTTING OUT OF SILVER PLATING

To the Editor of THE METAL INDUSTRY:

I note an article in the November and December numbers of THE METAL INDUSTRY written by Messrs. C. F. Burgess and L. T. Richardson, on the subject named above, and note that in the article the gentlemen have gone deep into the scientific cause of the spotting out, but have not given us any definite remedy for overcoming it. But they have proven that a 98 per cent chemically pure potassium of cyanide is a cheaper and better chemical to use in all cyanide plating solutions, which fact has always been very plain to me and to the platers at large. We should demand the use of it in all cyanide solutions. It is the demand for the pure chemicals that controls the market, and if the platers would refuse to use the inferior chemical it would be a benefit to them and the employers also, and would reduce the sale of inferior chemicals which only cause trouble in the plating room.

I am not sitting in criticism on these gentlemen, but am writing for the general information in regard to spotting out, and while I have not had any experience whatever in silver plating, I do know that the platers all have more or less trouble with spotting out in plating work, especially on plain surfaces and in bronzes and copper finishes. More so on the brass satin finishes, and the platers also know and have known for some time that the principal cause of the spotting out is porous metal. The cyanide, lye and potash solutions fill the pores, and as they do not come out in the drying, this produces what appears on the surface of the finished metal wherever the corrosion occurs in spots.

I will also state that these spots are more troublesome or more apparent on cast metals than on sheet. It has also been my experience that they are more apparent on brass and bronze castings than they are on cast iron and also more apparent on sheet brasses and on sheet bronze and on sheet copper than they are on sheet steel; while on steel forgings I have never found any spotting out whatever. I do not claim that I have any remedy for the spotting out on any of these metals except that one could avoid using the cyanide, the lye and the potash solutions, and in this way the pores of the metal will not be filled with these solutions. Where the brass or copper finish is desired on the metals, I would first give these metals a heavy nickel plate and then put on the brass or the copper, and for the copper finishes I would use acid copper solutions. I do not know of any process we have that will remedy or efface the spotting out after it once appears on the surface of the finish. Although I have tried lime water, heat, and treatments of all descriptions that I have read of and heard about, I find that none of them will entirely overcome or efface the spots. There has been a great deal of discussion and many papers have been published and many read before the platers society, and still the platers are having the same troubles with spotting out. It will be a boon to the platers of this country and the trade at large when the American Electro-Platers Society will have sufficient support to finance a laboratory to be established by this society for scientific research and practical experiments for the benefit of the platers belonging to this society. The results of the experiments of the experts employed in this laboratory to be published in the regular medium of the society, which every member will have mailed to his address and can read for himself. In this way it will truly be what it was originally intended it should be, namely, an educational society.

Now is the time for you, Mr. Reader, to write out your application to the nearest branch of this society and add one more to the large number already trying to carry out this idea of fellowship in this fellowship for your own good.

T. C. EICHSTAEDT.

Detroit, Mich., December 28, 1913.

GOLD VS. KARAT GOLD

To the Editor of THE METAL INDUSTRY:

In view of the fact that there is now on foot a movement to introduce into Congress a resolution which, if passed, would admit any manufacturers of jewelry to stamp any alloy of gold that was at least nine carat gold as solid gold the following may prove timely:

In the marking of gold we find that the word "gold" is

very much abused inasmuch as any alloy of gold is called solid gold. Chemistry teaches us that the word "gold" means a very soft metal with a deep yellow color and which is known by most people as .1,000 fine or twenty-four carat.

We have no right to make a mixture of nine parts of gold and fifteen parts of alloy at a total of twenty-four and call it gold. You may call it nine carat gold or you can make any carat you choose and mark it the carat that it really is, but it should never be marked gold or solid gold, as this is misleading to the public. No manufacturer should object to this, and there should be a law that would prohibit anything from being marked gold unless it should have the stamp on it.

We may believe that the word "solid" means, for example, something that is not hollow, as, for instance, a bracelet made of 14 carat gold wire, while one made of 14 carat gold tubing is hollow, but the word "solid" or "hollow" should not be stamped on them. This is a matter for the salesman to talk up if he chooses to do so.

What right has Congress to make a law that nine or fourteen carat alloy is solid gold when it is not true? Congress can make a law, however, that nothing can be stamped solid gold or can be called gold unless the carat is stamped on it, also whether it be one carat, nine carat, or twenty-three carat.

JOSEPH T. BOLAND.

Providence, R. I., December 22, 1913.

BORO-CARBONE VS. CARBORUNDUM

To the Editor of THE METAL INDUSTRY:

In his article, "The New Artificial Abrasive-Boro-Carbone" in THE METAL INDUSTRY for December, 1913, Mr. Walter C. Gold states: "No substitute for emery as a polisher has ever been found." With due regard for Mr. Gold's opinion, I wish to take exception to the statement above quoted. In my opinion, based upon careful and repeated tests and comparisons, Carborundum is as much superior to emery as a polisher as emery would be to sand. Since testing it we have used Carborundum for more than a dozen years, and I do not hesitate to say that our product will compare favorably with the best, both as to quality and cost of production.

I believe the failure some who have tried Carborundum have met with was due to improper methods in production and use of their polishing wheels. It is my experience that a very fair emery polishing wheel may be produced under varying conditions as to quality, temperature and consistency of glue, temperature of wheel and abrasive, drying, etc., while in using Carborundum any old way will not produce a good wheel, but proper care and conditions will result in a far superior wheel.

FRANKLIN W. HOBBS.

Bangor, Me., January 5, 1914.

NEW BOOKS

ELEMENTS OF ELECTROCHEMISTRY. By Edgar F. Smith. 1913. Size 5 3/4 x 4 inches. 253 pages, including index. Several illustrations. Bound in boards. Published by the John C. Winston Company, Philadelphia, Pa. Price \$1.00. For sale by THE METAL INDUSTRY.

This little work has been prepared by the author as an aid in the teaching of electro-chemistry and is designed to bring the fundamentals of the science clearly before the attention of students. The work is made up from the writings of Davy, Faraday, Berzelius, Ostwald and Nernst, and their expressions are set forth in such simple language that what otherwise might be a complicated subject is most clearly explained. One of the chief charms of this little work is due to the fact that it is entirely different from any other work on electro-chemistry now procurable, and we have no doubt that the platers and electro-chemists who wish to get basic knowledge will be glad to avail themselves of the opportunity to obtain this work. We have had so many calls for a simple exposition of the principles of electro-chemistry, which hitherto we have been unable to answer, that this book is particularly welcome at this time.

SAMPLING AND ASSAY OF THE PRECIOUS METALS. By Ernest A. Smith. 1913. Size 6 1/2 x 9 1/4 inches. 460 pages, including index. 166 illustrations. Bound in boards. Published by J. B. Lippincott Company, Philadelphia, Pa. Price \$4.50. For sale by THE METAL INDUSTRY.

This work, which is devoted to the sampling and assaying of the metals comprising gold, silver, platinum and the platinum group metals is the most recent work that has appeared, designed to meet the requirements of students and experienced assayers alike. The book is made up of twenty-five chapters and an appendix which contains very valuable information relating to the atomic weights, normal solutions and acids, and other useful data which one expects to find in a work of this kind. The question of the sampling of ores and other materials containing metals is very widely gone into, and instruction is given for meeting all sorts of conditions in the preparation of samples. The chapters on apparatus required for furnace operations and assaying are particularly complete and apprehensive. Taking it altogether the work should prove a very valuable addition to the library of the chemist, assayer and manufacturing jeweler.



Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO
SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS
THE METAL INDUSTRY.



ALLOYING

Q.—We write to ask whether you can give us any information in regard to the making of alloys for acid-resisting metal, the acids being hydrochloric and sulphuric.

A.—The following mixture gives a good acid resisting alloy:

Copper	76	to 78	parts
Lead	12	to 15	"
Tin	12	to 15	"
Zinc	1½	to 2	"

This alloy is used to a considerable extent for large condenser bodies that must handle acid water.—J. L. J. 1,909.

BRAZING

Q.—Please publish a mixture suitable for brazing aluminum.

A.—Richards' Aluminum Solder is the best solder for aluminum. It consists of:

Tin	29	parts
Zinc	11	"
Aluminum	1	part
Phosphor tin	1	"

This solder may be obtained from Janney, Steinmetz & Company, Philadelphia, Pa.—J. L. J. 1,910.

Q.—Could you give us a mixture for core sand to be used in very heavy castings from 4 to 6 cwt. each? We find a great difficulty in getting the cores dug out, as the metal searches through them, more especially when they are cast in phosphor bronze.

A.—A rather coarse core sand, high in silica, will give no trouble on phosphor bronze castings of the size you mention, if they are poured at a moderate heat. If they must be poured at a high temperature, a wash of finely ground silica flour, such as is used for steel castings, should be applied to the cores.—J. L. J. 1,911.

BRIGHTENING

Q.—I am daily using bright brass on white metal goods, but I do not get good results. I am using carbon and arsenic as a brightener. Is there any other method for a brilliant bright brass solution that will not have to have additions made to it and give better results?

A.—Unfortunately if you desire to obtain a very bright brass deposit continually there is no other method except the one you are using, unless you desire to discard the carbon bisulphide and dissolve the arsenic in caustic soda and water in the proportion of one part of soda to two parts of arsenic. This will give you as equally as good deposit and may save you considerable trouble. The constant addition of the carbon to the bath probably causes your difficulty. By adding arsenic and caustic soda such an addition need not be made more than once or twice a week.

Many platers by keeping their brass solutions rich in copper and the correct proportions of cyanide, are enabled to produce very bright deposits of brass by the addition of one-half to one pint of ammonia in baths of two hundred gallons capacity at the close of the day's work, thus avoiding the addition of arsenic.—C. H. P. 1,912.

CASTING

Q.—I am sending you a casting on which I would like to put a dull black finish. Also can you tell me what the metal is made of. I have tried black nickel but it does not seem to take to the metal.

A.—Your sample is what is termed a die casting. The metal is probably composed of the following:

Zinc	72	per cent.
Tin	20	"
Aluminum	2	"
Copper	5	"
Lead	1	"

The trouble you have to contend with in finishing the castings is the large amount of zinc in the alloy. If you can succeed in giving them a coat of nickel previous to black nickeling and use only a half volt pressure on your black nickel, you will then be able to produce a good black surface, providing the metal has not been previously polished.

A light sand blast will give the most satisfactory surface for a dead black finish.

If you are unable to accomplish results in the manner stated then it will be advisable to copper plate the castings, oxidize them with a liver of sulphur solution and lacquer them with a rubber of dead black lacquer, using the spray or dip for the purpose.—C. H. P. 1,913.

Q.—Can you give us a few formulae suitable for die casting work?

A.—For die cast bearings.—Lumen bronze formula:

Zinc	85	per cent.
Copper	10	"
Aluminum	5	"

For general work:

Tin	77	per cent.
Copper	7	"
Lead	5	"
Zinc	2	"
Antimony	9	"

For castings that have to be bent and must be very tough.—Parson's white brass, No. 2:

Tin	65	per cent.
Zinc	33	"
Copper	2	"

—J. L. J.

1,914.

CLEANING

Q.—I have some machine parts made by the die casting process, which, after handling, become black. Can you give me a formula for a solution that will bring them back to their natural color?

A.—To remove the black surface from your die castings caused by handling, it will be advisable to cleanse them in benzine or gasoline or immerse for a very short time in a dilute warm potash solution. Wash well in cold water and immerse for a few seconds in a muriatic acid dip, consisting of, one part of acid and four parts of water. This strength may be varied if the action is too violent by reducing with water. Wash the articles well after immersing in the acid and try out carefully.—C. H. P. 1,915.

COLORING

Q.—Can you inform us as to the best method of obtaining a crimson color running to a purple on small copper articles like ink wells, trays, etc. Also, what is a quick way to obtain a purplish brown on sheet brass articles. How is the finish known as Royal Red obtained on copper?

A.—A variety of tones from crimson to purple are readily produced upon polished copper articles by heating to various temperatures with bunsen flames.

Chemically, such colors are produced by immersing in hot solutions consisting of sulphate or acetate of copper in the proportion of eight ounces of the salts to each gallon of boiling water. Or immersion in a solution consisting of the following:

Hyposulphite of soda 4 ounces
Acetate of lead 1 ounce
Water 1 gallon

The purplish brown may be obtained by immersing the brass articles, which should have been finished similar to a brush brass finish, in a very hot solution consisting of:

Sulphide of barium 2 ounces
Ammonia water ½ ounce
Water 1 gallon

It is frequently necessary to dry out and scratch brush the articles very lightly to produce this finish and then give them a quick immersion in the dip a second time to tone the color. The articles should then be dried out and lacquered in the usual manner.

Royal red or royal copper is produced by polishing the surface of the articles; then cleansing and drying carefully. After which they are immersed in a molten bath of potassium nitrate until the surface becomes a purplish gun metal tone. The articles are then removed, immersed in boiling water, carefully dried and then polished upon soft buff wheels using jewelers gold rouge in finely powdered form mixed with denatured alcohol as the coloring medium. The potassium nitrate should be heated in an iron pot by the aid of bunsen flames.

A number of shades of red can be produced by the aid of the nitrate immersion in addition to the royal red depending upon the time of immersion.—C. H. P. 1916.

Q.—Would you please give me a little information how to dip very small clock and watch wheels (bright brass) so they will stay bright without lacquering? The work now comes out spotted.

A.—To overcome your difficulty after you have dipped the small clock and watch wheels in the regular way through the acid dips, proceed as follows:

Prepare a cyanide solution consisting of four ounces of cyanide to each gallon of water. Immerse the small parts in this dip for a second or two after washing well from the acid dip. Then remove and again wash in water and immerse in a hot or nearly boiling solution of platers' compound. This solution should consist of four ounces of Swan & Finch's Platers' compound to each gallon of water. After immersing in this solution shake off the excess of solution or wash off in boiling water and dry in fine maple or boxwood sawdust.

The immersion in the Platers' compound leaves an invisible film of grease upon the surface of the articles which protects the metal for a considerable time from atmospheric influence and also assists in drying the articles out more quickly when using sawdust.—C. H. P. 1917.

ENAMELING

Q.—What kind of black paint or enamel is used on automobile lamps where part is nickel and part black?

A.—Dead black baking enamel is used upon automobile lamps. This is usually applied before nickel plating and is baked at a temperature of three to four hundred degrees Fahrenheit. It is unacted upon by the nickel solution.—C. H. P. 1918.

FINISHING

Q.—I would like to know how to get a mottled black finish on metal ends of golf clubs. The metal is a composition of aluminum, zinc and copper with some other alloys.

A.—It would be difficult to determine the finish you refer to on the metal end of golf clubs unless we had a sample. It may be produced by immersion in a dilute solution of chloride of copper, then heating by the aid of bunsen flames. This will produce the black finish. The articles are then lacquered.

The mottling is done in various ways by the aid of round hard wood, revolved in a vertical lathe and a little fine emery and oil or pumice stone and water applied gives different mottled effects, depending upon the operator. The idea is to scour through the black finish showing the metal beneath.—C. H. P. 1919.

LACQUERING

Q.—Is it possible and advisable to convert a quantity of surplus hot lacquer into cold lacquer, and if so, how?

A.—Hot lacquers are usually composed of gum copal and sandarac, the solvent being alcohol. The reason why heat must be applied to the articles previous to lacquering is due to the rapid absorption of atmospheric moisture by the alcohol, when applied cold the results are: The moisture becomes incorporated with the gums and becomes white.

To change the lacquer so that it can be applied cold without the difficulties referred to, evaporate the alcohol from the lacquer as much as possible, using a hot water bath for the purpose. When the gums have become quite thick, reduce to the proper consistency for lacquering with a mixture of equal parts of amyl acetate and fusel oil. The lacquer can then be applied cold in the usual manner.—C. H. P. 1920.

Q.—Can you tell me anything about the gold color lacquer that has been used to color the pencil protector herewith?

A.—The pencil protector is made from what is termed in England high brass, in the United States low brass, and is finished in its natural color and lacquered with an ordinary brass lacquer and not as you surmise with a gold lacquer. The polish not being a very high lustre, is probably produced in a tumbling barrel by the aid of steel balls and borax soap water as a burnishing medium.—C. H. P. 1921.

STRIPPING

Q.—We shall be glad if you will kindly give us a formula for making a stripping solution to take the fire out of silver work. The solution which we are now using takes about half an hour to strip general silverware, whereas we believe there is a solution in the trade that strips instantly.

A.—One of the latest methods is to add one or two ounces of yellow prussiate of potash to the nitric acid dip and use this hot. This removes the fire scale quite rapidly. The articles should then be washed thoroughly in cold and boiling water to which is added 1 ounce of platers' compound per gallon of water. Some platers arrange a warm solution of cyanide of potassium or sodium as a plating bath, using a reverse current and sheet carbon or steel as the cathode, the articles being arranged as the anode. The density of the solution may vary from 3 to 5 degrees. The combination of the heated cyanide solution and the current removes the fire scale quite readily, giving a solution of cyanide of silver which is frequently used as an addition to silver striking baths.—C. H. P. 1922.

TINNING

Q.—We would like to inquire if you can advise us regarding best practice in electro-plating of tin. We have a considerable amount of iron and brass pipe fittings which we wish to tin-plate and would like to have as much information as you can give us regarding this practice, covering such points as cleaning of work before and after being put in the solution and what voltage current should be applied and how long it should be left in the tank.

A.—For your purpose the following formula will give good results:

Water	1 gal.
Cyanide of sodium	5 ozs.
Caustic Potash	1½ "
Chloride of tin	2 "

To prepare the solution dissolve the caustic potash in the water (preferably warm); then add the tin salt and stir well and add the potassium cyanide. Use the solution cold with anodes of sheet block tin. As much surface as possible should be used. Voltage of 2½ to 3 volts.

A good deposit can be obtained in five minutes, but if heavy deposits are required the articles must be removed from the bath and scratch brushed at frequent intervals on account of the crystalline nature of electro deposited tin.—C. H. P. 1923.



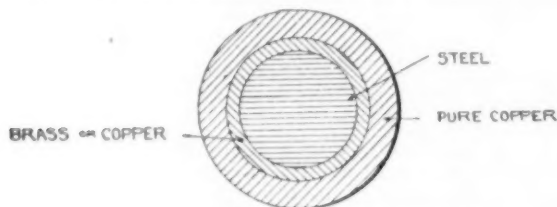
PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.



1,078,906. November 18, 1913. **Process of Producing Clad Metals.** B. E. Eldred, of Bronxville, N. Y.

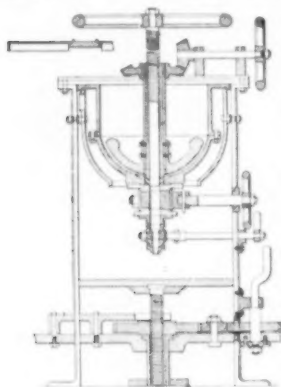
This invention relates to processes of producing clad metals; and it comprises a method of making compound metal billets having a core of iron, steel or iron-like metal firmly and permanently united to a sheath of copper or copper-like metal by the intermediacy of a linking layer of metal wherein a core of



iron or like metal coated with the linking metal is inserted in a comparatively cold condition in a tubular shell of the sheath metal, such shell being employed hot and being of such dimensions that the cooler core will just fit therein, and the assembled core and sheath are heated together whereby the expansion of the core produces a union of the metals as shown in the cut.

1,078,921. November 18, 1913. **Apparatus for Melting, Compressing and Forging Metal or Alloys Into Dies.** W. S. Hanna, Jr., of Manchester, England.

The invention relates to improvements in or connected with metal compressing or forcing machines and especially to such as are used in dealing with Babbitt metal or other white metal alloys in a molten or fluid state for any purpose whatsoever.

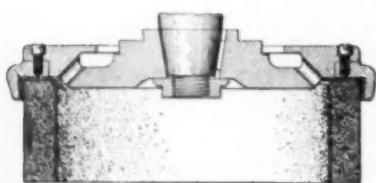


The invention may be used with immensely improved result in cases where bearings or bushes are being manufactured or made solid from Babbitt or other white metal alloys alone or in cases where cast metal shells or backings of any other kind are to be lined with the metals or alloys referred to. The invention may also be employed with greatly improved results when casting alloys of phosphor bronze, gun metal, brass, copper, zinc, aluminum for bearings or bushes or for any other purpose, or for steel or cast iron.

The object of the invention is to provide means, as shown in cut, which on their proper application and use will give a gradual pressure up to or over 500 lbs. to the square inch according to the nature and requirements of the case, especially in the operation of making bearings or bushes solid from white metal alloys alone or where bearings or bushes are being lined with white metal alloy.

1,079,304. November 18, 1913. **Mounting of Abrasive Wheels.** H. K. Spencer, Dorchester, Mass. Assignor to Blanchard Machine Company, Cambridge, Mass.

This invention relates to the mounting of abrasive wheels. Referring to the illustrative embodiment of the invention there



is shown a spindle, to which a usual face plate is secured in any suitable manner. An abrasive wheel which may be of any usual or desired form, is secured to the face plate in a novel manner. The abrasive

wheel is herein shown as formed with straight sides, that is to say, its periphery is cylindrical. Herein, the wheel is secured to a retaining ring which in turn is secured to the face plate. The retaining ring is provided with a flange, which overlies the edge of the wheel, and is tapered with reference thereto, so as to provide an angular space which is filled with cementitious material, such for example as ordinary Portland cement.

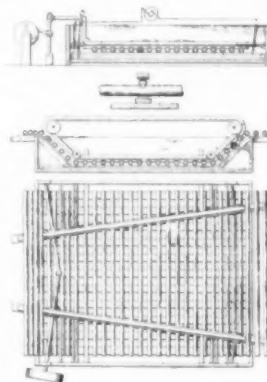
1,079,786. November 25, 1913. **Process of Hardening Copper.** J. A. McLarty, Toronto, Ontario, Canada.

This invention relates to a process of tempering copper and the object is to devise a method imparting a greater degree of hardness to copper than is possible with present known processes and without adding any other metal to form a copper alloy.

The soft copper is fashioned in the usual manner to form substantially the finished articles and these in any convenient quantity are then placed in a closed chamber which is provided with any convenient means of heating. In this chamber the copper articles are heated to a high temperature (say 1,600 degs. F.) at the same time the chamber is filled with a reducing gas such as carbon-monoxide and in this chamber in contact with a reducing agent the copper articles are allowed to cool. When cold they will be found to have acquired a high degree of hardness.

1,079,428. November 25, 1913. **Apparatus for Electroplating pipes.** D. H. Murphy, Pittsburgh, Pa. Assignor to American Conduit Company, Pittsburgh, Pa.

This invention relates to an improved apparatus for electroplating rods or pipe, by which the rods or pipe being treated



are moved positively in the plating solution so that all portions of the surface of the rods or pipe are presented uniformly for the electrolytic operation. By the invention the operation may either be intermittent or continuous, and while the apparatus is somewhat different for the continuous operation from what it is for the intermittent operation, the essential constructional features characterizing the invention are incorporated in both arrangements.

An essential feature of the apparatus, as shown in cut, of the invention is a support for the pipes upon which they may rest and be rolled so as to present the surface of the pipes uniformly to the plating operation, and in combination with such a supporting surface. There is provided an operating member having a yielding surface in engagement with the upper surfaces of the pipe, so that by movement of said member the pipes are positively rotated in the plating solution. The operating member is provided with an inflated hose or tube which serves as the yielding means engaging the pipes.

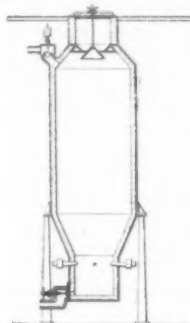
1,080,100. December 2, 1913. **Process for Manufacture of Lacquers and Varnishes.** Arthur Cohn, of Neukolln, near Berlin, Germany.

The present invention is an improved process whereby wood oil can be made into lacquers or varnishes which dry quickly with a lustrous surface and hard elastic texture, irrespective of the climate, light or temperature, with the use of only a small percentage of a suitable drier and without the necessity of any addition to the wood oil of other fatty oils, resins and the like, such as have heretofore been used.

This object is effected by adding to the wood oil, in addition to any desired driers, terpenes and terpene turpentine oil, pine oil and the like, which are ordinarily used in the manufacture of lacquer and which have an average boiling point of from 153 degs. to 162 degs. C. give little or no help in producing a hard and lustrous surface. An entirely different product and an improved effect are obtained by adding to the wood oil, instead of the oils ordinarily used, terpenes, such as terpene oil, terpineol, and the like, preferably having a minimum boiling point of about 170 degs. C.

1,080,102. December 2, 1913. Process of Reducing Zinc Compounds. E. B. Cutter, Erie, Pennsylvania.

This invention relates to the production of metallic zinc, and especially to a furnace process of effecting the reduction of zinc oxide.



Metallic zinc has heretofore been obtained by the reduction of zinc ore in the well known retort furnace and condensing the vapor. The objections to this process, due to the expenses for fuel and repairs and the losses due to the breakage of retorts which rapidly deteriorate in use, especially when working on ores containing lead and iron, have led to frequent proposals to smelt zinc ores in cupola furnaces. All such attempts as have been made have been unsuccessful, because the vapor of metallic zinc has been reoxidized before it could be collected; and because the fluxing material necessarily present prevents precipitation of the zinc.

According to this process there is employed zinc oxide free from gangue and other bodies as the substance to be reduced, and effect its reduction in a cupola or low blast furnace, as shown in cut, in a reducing atmosphere under pressure, collecting and drawing off the liquid zinc from beneath the charge.

1,080,155. December 2, 1913. Aluminum Alloy. W. N. Naylor, of Forest Hill, England, and S. P. Hutton, Beckenham, England.

This invention relates to an aluminum alloy.

The alloy consists of aluminum, magnesium, phosphor tin and phosphorous, the proportions of which may vary. The proportions may, for example, be as follows: Aluminum 93.89 per cent.; magnesium 4.89 per cent.; phosphor tin .73 per cent.; phosphorus .49 per cent. The phosphor tin, above mentioned, is five per cent. phosphorous..

1,080,925. December 9, 1913. Tube Forming and Sheathing Apparatus. F. N. Palmer, Kenosha, Wis.

This invention relates particularly to tube forming and sheathing apparatus, useful, for instance, in producing brass-covered steel tubes for bed-construction purposes.

The primary object is to provide improved means which will operate in an improved manner to form and jacket tubing, producing a satisfactory article.

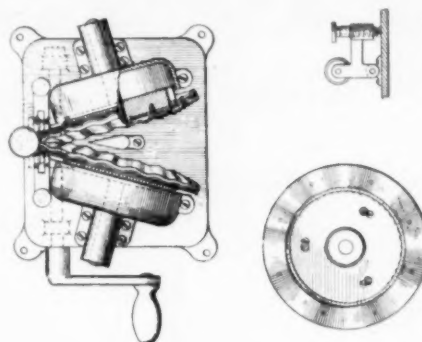
The invention is particularly useful in forming a tube from sheet metal, such as sheet steel, and covering the tubing with a brass sheath, formed from a brass ribbon and embodying a lock-seam joint.

The invention facilitates and cheapens the manufacture of sheathed tubing of this character, and at the same time produces an improved article in which the lock-seam is meshed or embedded in a preparatorily formed external groove in the steel tubing, resulting in the production of an article in which the seam of the sheath is scarcely visible, in which the sheath is in close contact at all points with the tube which it envelops, in which the sheath is uninjured by the applying operation, and in which the product closely resembles a seamless brass tube.

A further object is to provide an improved method of producing sheathed tubes, whereby the sheathing may be applied without injury to it, the use of excessive pressure being obviated, and whereby an improved product results.

1,081,002. December 9, 1913. Polishing Device. C. F. Sperry, Chicago, Ill., Assignor of one-half to Seth Coltin, of the same place.

This invention relates to polishing devices and has for its object the provision of an improved device of this character

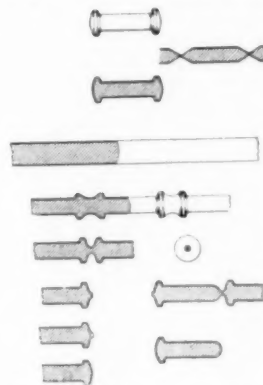


which may be of particular use, for instance, in polishing more or less flat surfaces such as knives and similar articles, and is of such a character that it may be durable, efficient, and be provided with easily replaceable parts, when such parts through wear need replacement.

The invention contemplates a pair of revoluble, preferably corrugated disks, as shown in cut, having suitable polishing material on the face thereof, between the polishing material of the two disks such articles as knives being suitably polished. Suitable adjusting devices are provided for maintaining a predetermined amount of pressure between the disks. The disks are also of such a character that they may be readily removed from the rest of the apparatus.

1,081,451. December 16, 1913. Process of Making Platinum Covered Pins. C. H. Kerk, Wayne, Pa.

The object of this invention is to improve the manufacture of platinum covered pins so as to insure the inclosing of the core with platinum.

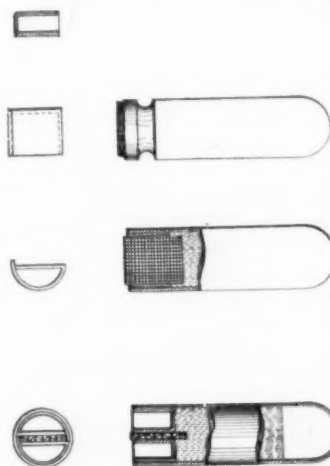


The invention is particularly applicable for use in the manufacture of pins for dental purposes, such, for instance, as those which are employed to hold artificial teeth to their base. It will be understood that a pin of this type can be used for other purposes without departing from the essential features of the invention.

The inventor claims: The process of making platinum coated pins; said process consisting in covering a core with platinum; indenting the pin at intervals to reduce its diameter; severing the pin at the reduced portions; and then turning over the platinum covering onto the exposed portion of the core, as shown by the cut.

1,082,279. December 23, 1913. Device for Treating Type Metals. E. M. Low, New York, N. Y.

The object of this invention is to provide a means of treating type metal or the like whereby a cleaning agent may be

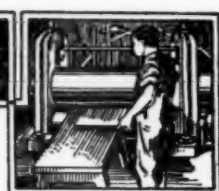


inserted into molten metal and be brought gradually into contact therewith, thereby preventing the escape of the cleaning agent to the surface of the metal before it has been brought into contact with all parts of it. To accomplish this there is provided a shell containing a cleaning agent, in liquid form or of such composition as to become liquid at the temperature of the molten metal in which it is to be used, the shell being provided with means hereinafter described whereby the contents may escape gradually into the surrounding metal in which it is immersed. These ob-

jects are attained by the device illustrated in the accompanying cut.



EQUIPMENT



NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF
INTEREST TO THE READERS OF THE METAL INDUSTRY.

HIGH SPEED NICKEL SALTS

By T. C. EICHSTAEDT.

The plating trade of Germany, according to reports, seems to be far advanced in comparison with what it seems to be in this country, for there have been introduced in this country a number of the German and also French patented plating preparations, quick plating preparations and especially high speed nickel salts, as I like to think of them as "High Speed Nickel Salts," and there have also sprung up in this country a few imitations of these imported salts. I say imitations for I have tried them out. The claim that is made for these imitations is that they are as good as the original imported goods, and they have been put upon the market to get the trade, without the high speed and quality of the imported salts. While the plating trade of this country has always thought itself equal or even greater in inventing mechanical devices for turning out a larger volume of cheap nickel plated articles on the market than any of the foreign countries, we must now admit that for high speed and high grade plating preparations Germany has the best of us, and we, if we would keep up with the foreign platers, must adopt these patented preparations, though it seems rather humiliating to this progressive America of ours to have to do this.

The claims for these new salts may seem rather presumptuous considering that all these years the plating trade of this country and at large have been using Dr. Adams' nickel solutions with what seemed to be good success and a good quality of nickel plate. These new salts come from Germany with a claim to give us a better deposit in one-third the time that Dr. Adams' solution does the work, and it does seem rather strange that some of our "clever leaders" of the plating trade could not have given us as good if not a better preparation for doing this high speed nickel work, and not have us feel that we have again been outdone by our German fellowcraftsmen.

These new high speed nickel preparations, if adopted and worked according to the directions that the discoverer has given and these directions adhered to as closely as the old school plater adhered to the directions of Dr. Adams, will produce more wonderful transformations than did Dr. Adams' solutions for the platers who used them. It has been generally claimed that in order to have a good high luster nickel on steel or iron, it was necessary to first plate the iron and steel in the copper solution, and while the claim is also made that this copper deposit is necessary as a preventative of rust, this new patented preparation called "Prometheus Nickel Salts," does deposit directly on both iron and steel as rapidly, and will adhere as well as the copper does. It is a greater preventative of rust than the copper deposit is. The process is also cheaper and the deposit is of pure nickel, not contaminated with any other metal. It is also non-porous and will give as high a luster with but one plating operation and one buffing operation.

As mentioned before, Prometheus Nickel solution does away with the necessity of copper plating entirely on iron and steel, which is to be nickel plated, and the work need not be polished any better than it now is for what we have been calling "Duplex Nickel." If the plater will leave the work in the Prometheus Nickel solution as long as he now does this work in the copper and the nickel solutions together, it will need no more buffing than the duplex copper now needs. Herein any wide-awake manufacturer can see that a saving in time and equipment can be made by adopting this new high speed nickel preparation. The plater can leave the work in this Prometheus solution as above stated, but it is not necessary, for this solution deposits in just one-third of the time, and gives a better and heavier coat of nickel than the regular double salts solution would deposit. Bronze and brass work, which is to be nickel plated, if it is colored before plating, can

be plated in from five to ten minutes in the Prometheus solution, and not need to be buffed at all after plating. This solution, while it plates heavier than the regular nickel solution, gives a deposit that is brighter, and one not familiar with this solution, seeing the work come out of it so bright would think that the tank, or solution, rather, was not working properly, or that he had a loose connection somewhere, or that someone had forgotten to turn on the switch, or that the dynamo had dropped its voltage, but he will find on testing the deposit, that he has a deposit that is as heavy as the regular double salts solution would give him in three times as long an immersion.

I have never seen any nickel solution that would do this, and keep it up without doping it continually, but this Prometheus solution does not need any doping whatever, except a little acid should it turn alkaline, and a little carbonate of nickel mixed up to a paste in a little of the solution should it turn acid. This is absolutely all that is needed in this solution at any time after it has once been made, and this need never be done if the plater will be, as he should be, careful not to carry any acid into the solution with the work from the acid dips, cyanide or other alkaline solutions. In short, if he is careful in thoroughly rinsing all the work before it is put into this nickel solution he never need add anything to the Prometheus nickel solution, but keep it filled with cold water. While this seems ridiculous, it is nevertheless a fact, for I have proved it.

As previously mentioned, I have tried a few of what I call imitations of Prometheus nickel salts, for I was in a position where I had the opportunity to do so, and gave them a thorough tryout, not in as strictly a scientific way as some of our professional electrical chemists might have done, but in a thoroughly practical way from the standpoint of an experienced plater in his regular work. By making up a whole tank of solution and running it according to the directions given by the manufacturer of these salts, and compared their results with the work of the regular double nickel salts solution. These various solutions all do work good on the start, but before running them a month get no better or quicker deposits than a regular double nickel salts solution. I can say that Prometheus prepared nickel salts solution did come up to the claims of the manufacturer, and I am convinced that it is the solution for the plating trade, and at this present writing I know of none better.

I will now try to tell why this solution is more economical than any other nickel solution. The first cost will seem to be considerably higher than any other nickel salts that I know of, but it is really cheaper in the long run. In the first place it will require only one tank full of solution to do the same amount of work that three tanks of the same size would be required for the regular double salts solution. Where only one tank of the regular double salts solution is now required, if this solution is replaced by Prometheus, this one tank will do the same amount of work that is now being done in one-third of the time. Manufacturers of electrical supplies, and, in fact, any large manufacturing concern can, by adopting this Prometheus High Speed Nickel solution, reduce their equipment, giving them more room and doing their work in one-third of the time that is now required by using the regular double nickel salts, and giving them a PURE nickel deposit and also reducing the cost of their buffing A 98 to 99 per cent. pure nickel anode should be used in this solution. There is absolutely no sediment in the bottom of the tank of this Prometheus Salts solution. The anodes will not be found to corrode or become coated. The solution will always remain clear, there being no foreign element in this solution, and the anodes being pure nickel there will be

no iron in the solution; therefore a PURE NICKEL DEPOSIT is obtained.

It requires to make this solution two pounds of Prometheus nickel salts to a gallon. The solution should stand at a specific gravity of about sixteen (16) degs. Baumé, hydrometer scale, and the electric current of two and one-half to five volts can be used without fear of burning or peeling, and there is absolutely no pitting. The anode surface should

always be greater than the cathode surface. The solution is sustained by this electrolyte, and therefore no nickel salts need to be added to this solution, provided the anode surface is always greater than the cathode surface, and this can be maintained by using the bar, elliptic or diamond shaped anode. These anodes wear down evenly and can be crowded together and new ones put in to maintain the anode surface, and to preserve the uniformity of deposit.

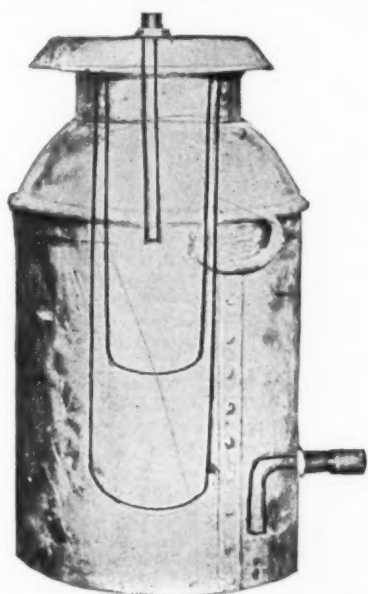
CLEANING BY VACUUM IN THE SHOP

HOW METALWORKERS MAY USE THEIR PRESENT BLOWERS FOR THIS WORK AND WITH THE BEST RESULTS.

By R. E. SIBLEY.

How many metalworkers have taken the time to consider the advantages to be derived from the use of a vacuum cleaning outfit? There is no doubt that many have had this subject before them for consideration, and probably many of them have discarded the idea, believing that the expense involved too great an item. A vacuum cleaning outfit, however, when the proposition is handled in the right way, can be installed with comparatively little expense, and nothing need be said in regard to the advantages to be derived from its use.

The metal worker is in a particularly good position to derive benefit from such an outfit, not only on account of the question of cleanliness in the plant and office, but also from



A MILK CAN SEPARATING TANK.



VACUUM PUMP.

the fact that the outfit can also be used in connection with other work in the establishment.

In connection with a vacuum cleaning outfit of the right sort there is generally supplied a rotary vacuum pump, such as is manufactured by Leiman Brothers, of 62 John street, New York City, and which is described elsewhere in the advertising columns of this publication. This particular vacuum pump may not only be used for the suction in the cleaning operation, but may also be used for blowing, and in this way becomes available for use in connection with a sand blast, blowpipes, gas furnace or agitation of solutions.

Of course, aside from these uses there are many others, such as cleaning dust and dirt out of intricate parts of machinery, electric motors, etc., by blowing with the air jet, and for melting, brazing, annealing, etc., where a machine shop is in operation in connection with a factory.

It can therefore be readily seen that if one of these machines is installed primarily for use with the above appliances or any other uses, it may be connected up for vacuum cleaning, etc. This is not an expensive operation, as all that is required is the ordinary dust separating tank, suitable lengths of pipe or hose, and the cleaning tools.

We show herewith an illustration of how a simple separating tank can be constructed. This is made of an ordinary

forty-quart milk can which may be readily procured at the expense of a couple of dollars. The cover of this can forms an air-tight tank and, therefore, is especially adapted for this work. A round hole is cut in the cover and a pipe connection made, as shown in detail in the sketch. The pipe or hose connecting the tank with the cleaning tool is attached at this connection. The connection from the can to the pump is made at the bottom in the same manner as above. This can is to act as a screen and to prevent the dust and dirt from entering the pump, and it, therefore, becomes necessary to provide a screen in the can to catch the dust and dirt. This is provided for by means of a bag made in suitable shape to set into the can about three-fourths of the way down, and made to rest over the neck of the can in such a manner that the cover will be drawn down over the top, holding it secure. This bag may be made of some suitable material, such as canvas, cotton flannel or suitable silk bolting cloth, depending on the amount of dust and dirt to be removed. The connection to the pump is made by means of pipe nipple and a union. The machine is now ready for operation after attaching a belt to the pump from the motor or a line of shafting.

There is one great advantage attached to the use of vacuum cleaning outfits which is not the case with the other methods of cleaning. When a room is cleaned with this process the dust and dirt is actually taken up and removed, and, therefore, each successive cleaning reduces the amount of dirt to be removed, and makes it unnecessary to clean the room as often as would be the case where other means would be employed.

There is no doubt that a great many metal workers would find it profitable not only to install a vacuum cleaning outfit, but a sand blast or gas furnace as well, where these are not already used, because all of these are labor-saving tools. The metal worker, in particular, should be a leader in the matter of cleanliness, and, therefore, this system should appeal to him with special emphasis. Many shops have already installed this system and many others are seriously considering this matter, but it is to those who have not already had this matter brought to their attention that this article is addressed, and an outfit can be installed for practically little expense, considering that the pump should be one of their tools in trade already.

These pumps may be procured separately and the balance of the outfit assembled by any one with any ordinary mechanical ability, or the entire outfits may be secured and the proper connections made. The pipe for blowing can be led from the pump to where the air blast is required, and used as stated above for the various purposes in connection with the regular shop work.

NEW SAND BLAST DEPARTMENT

Extensive changes for 1914 are in progress in the Mott Sand Blast department of the De La Vergne Machine Company. H. D. Gates, secretary-sales manager, and Foster J. Hull, engineer for the past five years with the Pangborn Sand Blast interests, have associated with the Mott Blast, and the facilities of the De La Vergne Company at East 138th street, New York, with their experience will be given to an extension of the Mott lines.

Complete cleaning rooms which have been already installed in a number of plants are designed to meet any condition, and the building of special and automatic sand blast machines, will be a feature of the Mott line, which already embraces hose machines, barrels, table machines and cabinets.

BALL BEARING POLISHING LATHES

The ball-bearing polishing lathes, shown below, manufactured by Gardner Machine Company, Beloit, Wis., are as well adapted to the underbelt style of drive as the overhead belt. Fig. 1 shows their No. 3 ball-bearing lathe arranged for underbelt drive. The countershaft is placed on ceiling of the room below, the belt passing up over the spindle pulley within the base. A sheet metal cover completely encloses the spindle pulley so that the only

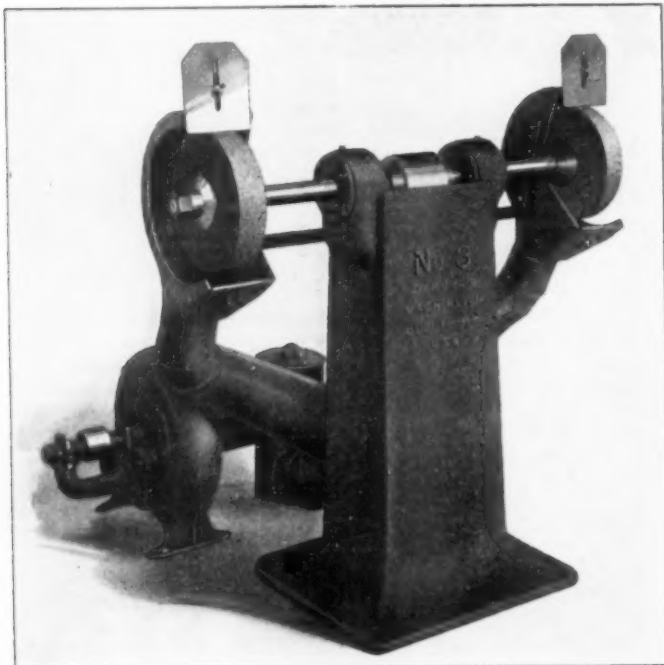


FIG. 1. GARDNER NO. 2 BALL BEARING POLISHING LATHE.

moving parts visible are the spindle extensions on both sides. For overhead belt drive it is simply required to remove this cover.

Fig. 2 shows the same lathe with cover removed for overhead belt drive and fitted with complete dust exhaust system. This outfit is frequently installed in plants where but one or two lathes are used; or, where a single lathe is located in some isolated part of the factory not reached by the general exhaust

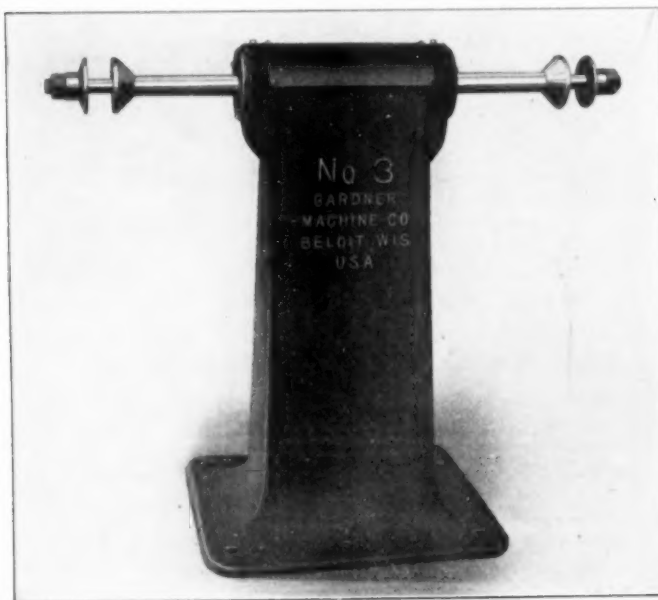
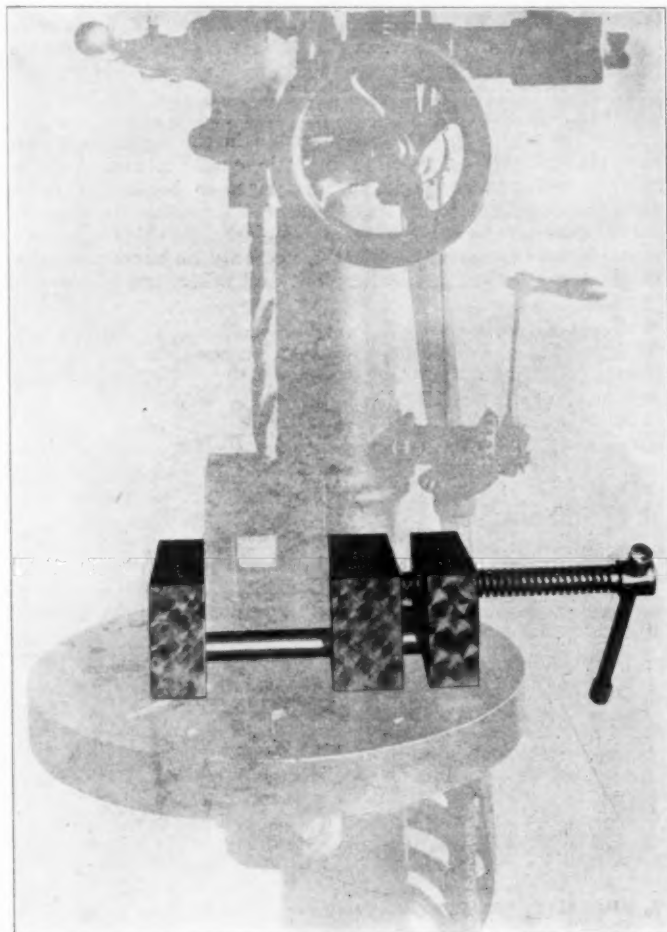


FIG. 2. SAME LATHE WITH THE COVER REMOVED AND FITTED WITH EXHAUST SYSTEM.

system. The manufacturers build ball-bearing polishing lathes in floor, bench and motor driven types in four sizes, of which the No. 3 is the largest. The spindle is 2 inches in diameter and the arbor $1\frac{1}{4}$ inches in diameter. The total length of spindle is 49 inches. Three different types of spindles can be furnished for any size lathe.

ACME DRILL PRESS VISE

The vise shown in the cut is manufactured by the E. A. Lueck Company, Milwaukee, Wis., and is said to be one of the handiest tools for use in a machine shop. By its use any form of metal can be held firmly in position on a drill press so that they can be drilled accurately and true. All of the surfaces are machined and the vise is made of the best ma-



THE ACME DRILL PRESS VISE.

terials and is just the right weight to handle the work, without tiring the operator. The specifications of the Acme drill press vise are:

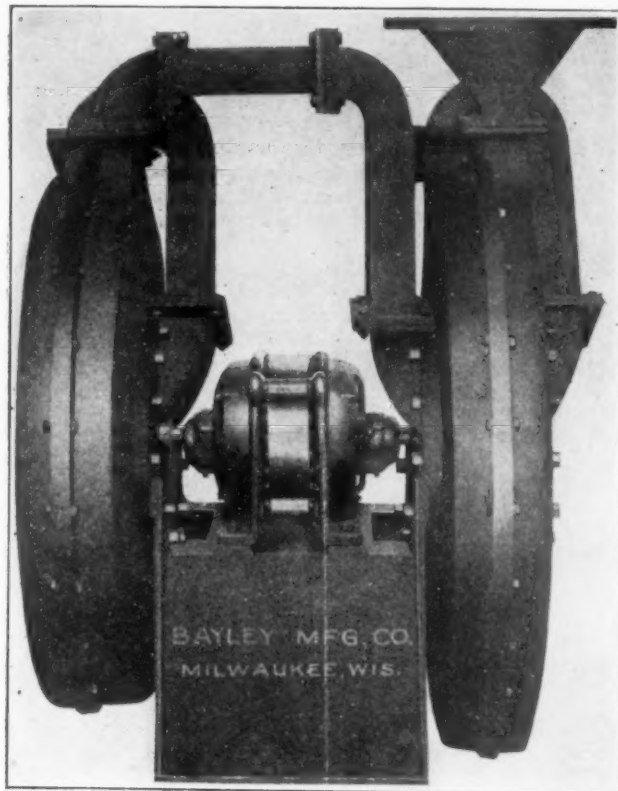
Weight (not boxed)	31 pounds.
Length, over all	$12\frac{3}{4}$ inches.
Length, opening of jaws.....	$4\frac{7}{8}$ inches.
Diameter of screw	1 inch.

Bushing of phosphor bronze, coarse pitch thread to assure quick opening and closing. Jaws are cut with V slots at right angles to each other for holding round work.

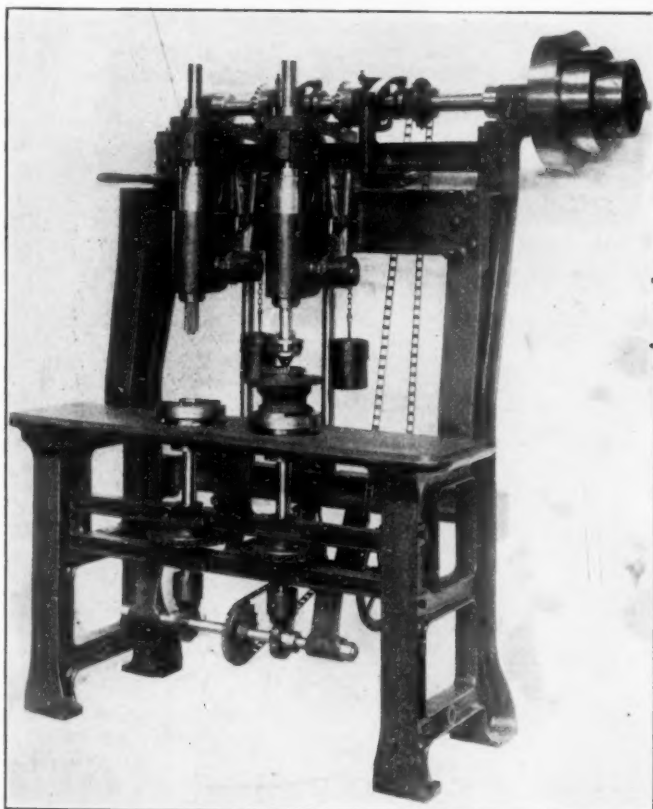
NEW BATTERY BLOWER

The blower shown in the cut is known as a continuous direct connected, and is adapted for oil and gas furnace use. These blowers are built in several sizes. The capacity of the smaller sizes range from 500 to 1,500 cu. ft. of air per minute at a pressure of from $\frac{1}{2}$ to $1\frac{1}{2}$ pounds per square inch. The larger sizes range from 1,500 to 5,000 cu. ft. per minute at a pressure from 1 to 3 pounds per square inch. The blowers are manufactured by the Bayley Manu-

facturing Company, Milwaukee, Wis., manufacturers of fan system heating and ventilating equipment, who will be pleased to answer any question regarding other information.



A NEW BATTERY BLOWER.



TWO SPINDLE VERTICAL GRINDER.

TWO SPINDLE VERTICAL GRINDER

This machine has been specially designed for grinding valve seats in a rapid and accurate manner. Several machines are now in use for grinding Pop Valves, Ball Joint, Flange Unions and other style valves from 2 to 6 inches. With one operator the machine will grind 200 valves per day. As shown in the illustration, machine has upper and lower spindles. The upper spindles revolve 10 to 1 over the lower spindles and in the opposite direction. A knock off is obtained by means of cams under lower spindles; this gives the grinding material a fresh bite and prevents ringing or groove cutting in the seats.

The machine is substantially built, the upper spindles running in phosphor bronze bushing and fitted with ball thrust bearings. It is noiseless in operation and guaranteed as to workmanship and material, also that it will do better and quicker work than can be ground by hand. The net weight of machine is 3,000 pounds. The manufacturers, Turner Machine Company, Philadelphia, Pa., will be pleased to furnish further particulars.

NEW NON-SKIMMING CRUCIBLE

The illustration shows a new crucible which has been evolved by Henry Weisbrodt, an employee of the Joseph Dixon Crucible Company, Jersey City, N. J., to be used by melters of precious metals. It has been designed to do away with skimming, and also



THE NON-SKIMMING CRUCIBLE.

the possible chance of charcoal or molten fluxes getting into the ingot or casting. This crucible has a bridge at the top, which, on pouring the metal, holds back the charcoal and foreign matter, and so delivers clean metal. This new design does not in any way reduce the holding capacity of the crucible, and the metal can be stirred satisfactorily as in a regular crucible.

TURPENTINE FACTS.

The Apothecaries Hall Company, 18 Benedict street, Waterbury, Conn., have issued a circular on turpentine that gives valuable information for preventing the heavy losses due to evaporation during shipment.

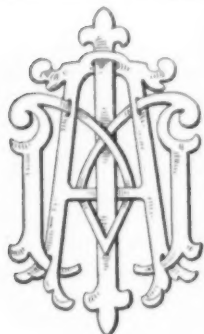


Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.



AMERICAN INSTITUTE OF METALS



President, G. H. Clamer, Philadelphia, Pa. Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 106 Morris avenue, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held in Chicago, Ill., September 7 to 12.

Secretary Corse says:

"The American Institute of Metals has made considerable progress during the last year. It has gained many notable technical men to its membership, and has done a large work in co-operating with the Bureau of Mines and the Bureau of Standards. The Bureau of Standards has appointed Dr. Geo. K. Burgess as Chief of Division of Metallurgy, who is actively co-operating with the American Institute of Metals in this work. The Bureau of Mines has appointed Mr. H. W. Gillett, who is working at Cornell University on various problems pertaining to the practical end of the brass business.

The bound volume, issued during the year, was much better than any previously sent out, and reflects great credit on the Institute as a whole. There is no question also but the following one, to come out within the next two or three months, will be quite an improvement on the one issued in 1913.

AMERICAN SOCIETY FOR TESTING MATERIALS

President, Robert W. Hunt, New York; Secretary-Treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The Society is affiliated with the International Association for Testing Materials and is a corporation formed for the promotion of Knowledge of the Materials of Engineering and the Standardization of Specifications and the Methods of Testing. Meets annually, the time and place being fixed by the Executive Committee.

In a brief reference to the progress of the American Society for Testing Materials during the past year, Secretary-Treasurer Edgar Marburg says: "It is especially gratifying to be able to point to the improvement in its publications, rendered possible through the betterment of its financial condition. With few exceptions, all of the many papers and committee reports presented at the annual meeting were preprinted, and for the most part, distributed in advance of the meeting. This has, in turn, resulted in a notable increase in the volume and value of the discussions.

"The past year has been in every sense a banner year in the affairs of the society. The increase of membership, as well as the increase in the attendance at the annual meetings, has been well maintained in relation to the previous rapid growth, and the amount of published matter is far in excess of that for any previous year. In addition to the membership pamphlet (190 pp.), the Year-Book (401 pp.), and the Proceedings (1141 pp.), the society has issued an Index to Volumes I-XII of its Proceedings (158 pp.), a volume containing certain selected Standard Specifications for Steel and

Steel Products in four languages (420 pp.), and a volume containing the valuable reports of Committee D-1 on Preservative Coatings for Structural Materials, for the years 1903-1913 inclusive (447 pp.). In addition to this matter, aggregating 2,750 pages, the society has distributed to its members, without extra charge, two bound volumes (2,376 pp.), containing the Proceedings of the Sixth Congress of the International Association for Testing Materials, held in New York in September, 1912, making a total of 5,133 pages of printed matter published or distributed.

The improved financial condition of the society has also rendered it possible, for the first time, to have all of the numerous diagrams and line drawings in its publications prepared by one of the leading experts in that class of work, so that these publications have now been brought to the high standard long in view, which heretofore could not be fully realized. Most of the thirty-three technical committees of the society have held one or more meetings since the last annual convention, and the outlook for valuable reports from these committees is very promising.

AMERICAN FOUNDRYMEN'S ASSOCIATION

President, H. D. Miles, Buffalo, N. Y.; Secretary and Treasurer, Dr. Richard Moldenke, Watchung, N. J. All correspondence should be addressed to the secretary, Dr. Richard Moldenke, Watchung, N. J. The objects of the Association are for the educational welfare of the iron and metal industry. Annual convention the latter part of May or early in June each year, in a succession of cities, as invited. The Convention of 1913 will be held in Chicago, September 29-October 3.

Dr. Richard Moldenke, secretary, and Walter Wood, vice-president of the association, recently returned from Europe in the interest of the international specifications for pig iron, pipe, etc., for expert purposes. Secretary Moldenke states that the proceedings of the Chicago convention will be issued in a few days.

AMERICAN ELECTRO-PLATERS' SOCIETY

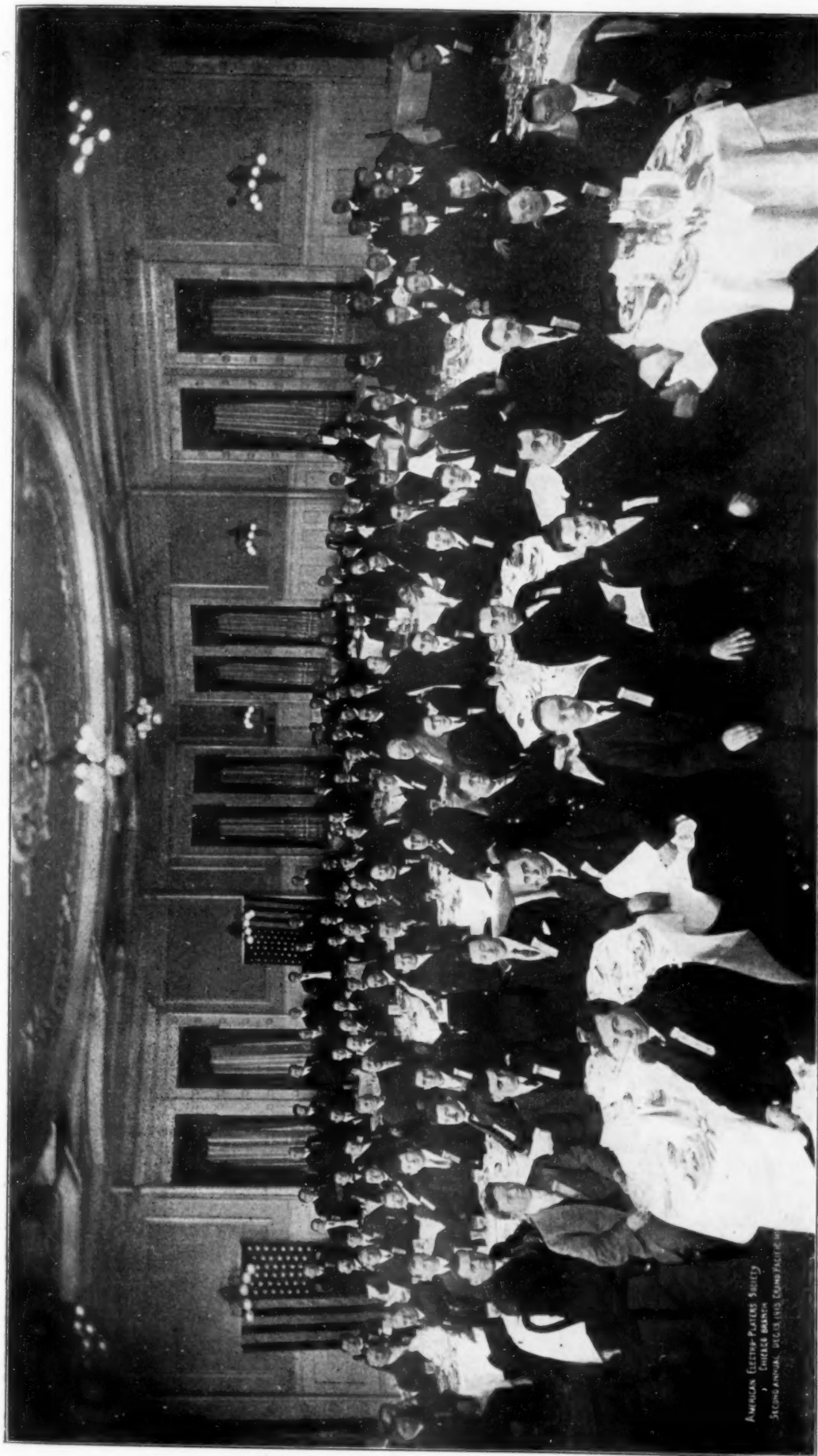
(AN EDUCATIONAL SOCIETY.)

President, Geo. B. Hogaboom, New York; Secretary, F. C. Clement, 462 North 50th St., Philadelphia, Pa. All correspondence should be addressed to the Secretary.

The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held the first week in June, 1914, at Chicago, Ill. The branch associations hold monthly and semi-monthly meetings in their various cities.

Secretary F. C. Clement, in reviewing the work of the Society for the past year says "that the society is now beginning to be recognized by the manufacturers and also by the





THE SECOND ANNUAL BANQUET OF CHICAGO BRANCH OF AMERICAN ELECTRO-PLATERS' SOCIETY HELD IN CHICAGO, DECEMBER 13, 1913, AT GRAND PACIFIC HOTEL.

various electro chemical, metallurgical and chemical engineering societies and the merchants' associations. Since the convention held in New York, May, 1913, the society has taken in two branches, Buffalo, N. Y., and Cincinnati, Ohio, which are flourishing and taking in new members every month. The reports from the various branches show that they are increasing their membership, and it is hoped that by the next convention, in Chicago, Ill., in June, 1914, that at least one hundred and fifty new members will be added to the number reported at the 1913 convention held in New York in May. The branches are looking forward to the next conven-

tion, and hope to have a large number of delegates appointed, as this will be really the first meeting of the national body.

The second annual banquet of the Chicago branch of the American Electro Platers' Society was held in the Grand Pacific Hotel, Chicago, Ill., on December 15, 1913, at which one hundred and fifty members and guests were present. The banquet was a complete success, and at its conclusion the following speakers made addresses: J. H. Hansjosten, president of the branch, on "The Society"; Charles H. Proctor, of New York, founder and first president of the association, made an exhaustive

address in which he reviewed the founding and growth of the society; Dr. Oliver P. Watts, on "The Theory and Practice of Black Nickel Deposition"; S. E. Huenerfauth, on "The Modern Dynamo"; H. E. Willmore, on "The Artificial Production of Colors on Metal"; and F. J. Liscomb on "What are Conducting Salts?" Among others who delivered short addresses were F. B. Emery, Dr. W. F. Jones, H. S. Sterrett, and O. E. Servis.

The regular monthly meeting of the New York branch was held at their rooms 309 West Twenty-third street, on December 26. John Nestor and Philip Morningstar were elected to active membership. Pro-

fessor Joseph W. Richards, of Lehigh University, gave an interesting talk on education and urged the members to get acquainted with the facts and fundamentals of chemistry. Charles H. Proctor gave an interesting talk on his trip out West, and President Geo. B. Hogaboom also gave a few words of advice. The topic for discussion was bronzing and oxidizing, and numerous colors, shades and methods of producing these finishes were given.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

The annual meeting of the company was held in Pittsburgh on December 9, at which time F. N. Perkins, president; R. S.

Buch, vice-president; J. S. McCormick, treasurer, and C. E. Hoyt, secretary, were all re-elected for the ensuing year.

The following directors were also elected: R. S. Buch, A. Buch's Sons Co., Elizabethtown, Pa.; F. N. Perkins, Arcade Manufacturing Co., Freeport, Ill.; Geo. R. Rayner, The Carborundum Co., Niagara Falls, N. Y.; J. S. McCormick, J. S. McCormick Co., Pittsburgh, Pa.; E. H. Mumford, Mumford Molding Machine Co., New York, N. Y.; A. M. Frauenheim, Herman Pneumatic Machine Co., Zelienople, Pa.; Henry A. Pridmore, Henry E. Pridmore, Chicago, Ill.; H. R. Atwater, The Osborne Manufacturing Co., Cleveland, O.; Wilfred Lewis The Tabor Manufacturing Co., Philadelphia, Pa.; Edward A. Pridmore, International Molding Machine Co., Chicago; E. H. Morgan, Arcade Manufacturing Co., Freeport, Ill.; C. E. Hoyt, Lewis Institute, Chicago.



PERSONALS



ITEMS OF INTEREST TO THE INDIVIDUAL.

J. F. Nestor, formerly of the General Electric Company, Lynn, Mass., is now connected with the United Novelty & Plating Company, 9-11 Playstead Road, West Medford, Mass., in charge of the plating department.

Nelson F. Flanagan, of Newark N. J., is connected with the Oxweld Acetylene Manufacturing Company, of Waverly, N. J., and not with the Oxy Acetylene Welding Company of the same place, as reported in THE METAL INDUSTRY for December, 1913.

Clarence A. Earl, vice-president and general manager of the Corbin Screw Corporation, New Britain, Conn., the largest subsidiary of the American Hardware Corporation, has severed that connection to become second vice-president and assistant general manager of the Hendee Mfg. Company, Springfield, Mass., manufacturer of Indian motorcycles.

Harry C. Carpenter, manager and treasurer of the Taunton Crucible Company, Taunton, Mass., for the past two years recently resigned his position with that organization. Upon Mr. Carpenter's retirement from the crucible company he was tendered a farewell banquet by the officers of the Reed & Barton Silver Company and the Bay State Crucible Company, at which Jonathan Bartley, president of the latter company in a semi-humorous speech presented Mr. Carpenter with a handsome present as a token of the esteem of a number of his Taunton friends. Mr. Carpenter has not at present made any definite plans for the future.

DEATHS

John H. Schumann, founder of the Moller & Schumann Co., manufacturer of varnishes, enamels and japans, Brooklyn, N. Y., died December 31, aged 74 years. He was born in Manheim, Germany, and came to this country about 60 years ago. In 1863 he engaged in business as one of the partners of Moller, Knaepf & Co., varnish manufacturers. He was president of the German Savings Bank of Brooklyn and a director in the Title Guarantee & Trust Company and Citizens' Trust Company. He was a charter member of the Manufacturers' Association of New York, in which he was active for many years. His death will make no change in the control or policy of the Moller & Schumann Co. He leaves a widow, two daughters and four sons, John H., Jr., Carl J., Frank M. and Alvin G. Schumann.

William Berkel, proprietor of the Wm. Berkel Chemical Company, manufacturers of Neutrol, Jersey City, N. J., died at his residence in Jersey City, November 19, 1913.

H. C. ATWOOD

Henry C. Atwood, vice-president of the Williamsville Buff Manufacturing Company, Danielson, Conn., died at his home in that city December 9, 1913.

Mr. Atwood was born in Williamsville, February 12, 1856, oldest son of William Allen and Caroline (Hargrave) Atwood, both of whom have passed away. His education was obtained in the schools of Killingly, at Friends' School and the University Grammar School in Providence, and was completed in 1878 at Brown University.



H. C. ATWOOD.

After completing his education he came back to Williamsville and was given charge of the store conducted by the Williamsville Manufacturing Company and continued in the position until the death of his father, in 1881, when he became superintendent of the mill and later agent of the company, which for many years made Williamsville all that it has been as a well-known manufacturing center.

Since disposing of his interests at Williamsville, a few years ago, Mr. Atwood made his home in Danielson, where he conducted the business of the Williamsville Buff Manufacturing Company. With him here have been associated his sons, Clinton W. and Harold B.

Charles B. McCanna, president of the Burlington Brass Works and of the Burlington National Bank, Burlington, Wis., died suddenly of heart failure on December 11, while attending a meeting of the National Association of Brass Manufacturers at the Hotel Astor, New York City. The Association appointed Messrs. Webster, Wolf and Niedeecken as representatives at the funeral, which was held at Mr. McCanna's home in Burlington, Wis., December 15, 1913.

John Williams, one of the pioneers in this country of the ornamental bronze business, died January 5 at his home, Lawrence Park, Bronxville, N. Y., of heart disease, aged 72 years. He was born in Ireland, and came to this country as a young man. He was president of John Williams, Inc., 556 West Twenty-seventh street, New York, manufacturing ornamental bronze and wrought iron work. He leaves a widow and a daughter.



Trade News



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

JANUARY 5, 1914.

Waterbury industries start on the new year without either a cheerful prospect or a definite forecast of less prosperous conditions than those of the past year. Attempts to obtain expressions of opinion from the manufacturers all bring out the sentiment that things are not exactly going to the dogs, and yet there is nothing sure enough about the good signs ahead to warrant forecasts that will warrant confidence in any but conservative, carefully laid plans. It will be some time before the tendency of business men and manufacturers hereabouts will be away from the most careful figuring, for the course is set for the most conservative channels until the adjustment of business to new conditions is accomplished.

Here in Connecticut the manufacturers have more circumstances to consider in this adjustment than in some other States. Two laws have gone into effect this year—the so-called Compensation act, an employers liability law that has many complicated features and is quite new to all industries, and the law forbidding the employment of women or children more than fifty-four hours a week. The latter has been met by readjusting schedules in the ten-hour day shops in various ways. Some have changed over for the present to six nine-hour days. Others have posted rules that all women and children coming within the law shall be dismissed at noon Saturday, when their departments are operating on full time schedules. Many of the shops are not operating full time, and as they are running less than the hours allowed by law the companies have not bothered about meeting the conditions to the extent of fixing a definite fifty-four hour schedule. These will announce their plans when business forces full time operations again.

In addition to these laws the metal manufacturers are still uncertain as to how they may be affected by the workings of the new tariff law. Up to date it has had no serious effect, as far as they can ascertain, on their business prospects, but while the present may be reassuring there is room for speculation as to the future.

Reviewing the past year's business, there is an almost unanimous report that the first nine months of the calendar year were quite satisfactory. The slump that was most serious occurred about the beginning of October, and the falling off of the last three months was marked in practically all lines of metal industry here. The one great exception was the Waterbury Clock Company and the watch-making end of that plant was the busiest of all the factories hereabouts. Departments in the Waterbury Manufacturing Company plant also were busy on full time as a rule, but in practically all but a few smaller shops there was marked dullness, forcing the laying off of a large portion of help, or the reduction of from twenty to fifty per cent. of full time, or both. Some of the smaller concerns, like the Novelty Manufacturing Company and the Noera Manufacturing Company, kept running almost on full time throughout the entire last quarter of the year, but without any assurance of the prolongation of that condition. Not so elsewhere. Skilled mechanics who had not been out of work for years joined the job-hunting squads throughout this section.

The cause was the steady falling off in orders, and even the star salesmen could not bring home business. After three years of prosperity that was unprecedented over some periods—the highest mark reached by many of the concerns hereabouts was registered in 1912—this slump came unexpectedly, but their conservative policy throughout the year had prepared the manufacturers for it and they are now simply marking time, ready to swing big or little orders promptly as they come in.

John P. Elton, treasurer of the American Brass Company, made the following statement about the present situation:

"The early part of 1913 was very good from a business standpoint. Towards summer a fagging in business was noticed, and this has kept up through the end of the year. It is early for indications to appear for business in 1914, although I am hoping that 1914 will repeat the prosperity of 1911 and 1912. It is too early yet to tell the effect the tariff will have on business."

Henry S. Chase, president of the Chase Rolling Mill Company, said:

"In the early part of 1913 business conditions in Waterbury were normal, in fact, rather better than what might be considered as normal. Later in the year, about the beginning of summer, there began a pronounced weakness in Waterbury business conditions, as represented by mill and factory work. The depression has continued throughout the fall and is not over now.

"As for the influence of the tariff and currency legislation, it is hardly time to attempt to say what it will be. The effect of such legislation will be better understood later. As for 1914, the year is too young yet to speak with any definiteness."

Plants of the American Brass Company are running five days a week, (fifty hours) as a rule. The American Pin Company, the Oakville Company and some of the departments of the Scovill Manufacturing Company are running full time, but most shops are operating with reduced forces, on a schedule of from forty-eight to fifty-five hours.

Similar conditions prevail throughout the entire Naugatuck Valley. The clock shop in Winsted, Gilbert Clock Company, is working with reduced forces and on a short time basis, with orders coming in but slowly. The Seth Thomas Clock Company in Thomaston also reports slow business and reduced orders. These plants are said to be seriously hit by the tariff changes regarding clocks. Torrington's industries, chief of which is the plant of the American Brass Company, are dull also, operating as in Waterbury, but there is a gleam of hope in the announcement of the beginning of work towards the erection of a million dollar addition to the American Brass Company's properties there, for a tube mill. Despite denials and rumors of postponement, work has begun towards clearing the site for the building. South of Waterbury the same conditions prevail as are described above.

Taken on the whole, the year 1913 was almost as good a year as 1912 and 1911, which were banner years for all the metal industries in the Naugatuck Valley, and the attitude of the government, the condition of European industries and the passage of the currency law in what is considered "workable" form, portend no serious evils to industry throughout the year to come. It will be some time, however, before the working people of this section will feel that times are really "good," for after three years of exceptional prosperity they are not enjoying the dullness of the present and charity and benevolent workers are making new records in their efforts to ameliorate conditions. Incidentally, the situation is taken by many as a penalty for Democratic success in national politics.

Charles F. Brooker, of the American Brass Company, is relinquishing some of his business activities. Recently he resigned from the National Republican Committee. At the beginning of the year he resigned as a director of the New York, New Haven & Hartford Railroad Company. He has also resigned from the board of directors of one of the New Haven banks. His age and the fact that his work as the head of the American Brass Company takes most of his time and energy are the reasons for these steps.

The Chase Rolling Mill Company's tube mill at Waterville is in operation, and the freight department of the company in connection with the mill is proving a very valuable addition to the company's equipment. It has resulted in a great

reduction of the freight congestion and freight department work at the Union depot, and has enabled the Chase shops to get their goods in and out much more easily than in the past, and with a great saving of time. This new mill is located on the Naugatuck Valley road, and has ample spur track facilities for several years to come. Not all the mill is now under operation, but a considerable portion has been completed and working throughout the past four months.

There have been rumors of the starting of a new brass plant in Thomaston, but there also have been denials. The conservative people of Thomaston who believe they know what goes on and that there is no prospect of such an addition to the town as a large metal plant, positively refuse to believe it. It has been learned that definite negotiations have been in progress between the owners of a large piece of land on the banks of the Naugatuck river with valuable riparian rights, and the New Haven Railroad Company for some time. Within the past six months there have been offers made by a Bridgeport metal industry for the tract, but the offer has not been high enough to suit the owners of the property. Negotiations are still pending, and it is not unlikely that either a metal making plant or a power plant for railroad purposes will be erected on the land in question, if it they are successfully culminated, but not in the near future.—F. B. F.

BRIDGEPORT, CONN.

JANUARY 5, 1914.

In line with the general business depression throughout the country the past month, this city was no exception and most of the metal lines experienced a very quiet period, possibly more so than in November. There seems to be a difference of opinion in comparing the general business activity in December with that of the previous few months, some claiming that it was better while others said it was not so good, although, of course, the advent of the holidays brought increased business to those lines which rely greatly on this season of the year. The silverware concerns were very busy, but it is true that the retail trade was not quite as heavy as a year ago, probably due to the fact that many people did not have as much money to spend in consequence of the shutting down of some factories and the curtailment of the forces of others.

It is reported on good authority that the brass concerns find business somewhat better than last November and the outlook encouraging for next year, particularly in the manufacture of brass goods such as automobile pumps, lamps, safety razors, etc., although there is not so much demand for copper wire, etc. The rolling mills are only fairly busy. The copper market appears to be stronger. One large manufacturer of brass stampings reports business better than the two preceding months and holds out an encouraging outlook for next year.

The manufacturers of automobiles found the past month about the same as in the fall, but are increasing their forces in order to turn out the spring models and look with favor on the coming months' business. This will, of course, bring increased work for the manufacturers of automobile parts such as brass hub caps, brass, bronze and aluminum castings, etc.

The brass and aluminum foundries experienced a quiet period, but look for renewed activities in the coming months now that inventory time, that great retarder of business, has been passed. Aluminum seems to have reached a low point and the market is now slightly stronger.—F. H. C.

BOSTON, MASS.

JANUARY 5, 1914.

Industrial conditions vary greatly with different concerns in the Boston metal trades, although the majority of workers in brass, copper and nickel declare that demand for their output has diminished considerably in recent weeks.

Some of the manufacturers and shop managers state that it is now the usual quiet season in many lines, and the slackness encountered is what might naturally be expected. At the store of Herman Strater & Sons, Sudbury street, this is the report on affairs at present in their special lines of production. On the outlook for 1914 no prediction is ventured as yet.

The E. B. Badger & Sons Company, a large part of whose output is for construction work, reports a quiet interval now, but regards existing conditions as seasonable and likely to prove merely temporary. For the present the management continues optimistic regarding prospects for 1914.

One large concern, not quoted, is contemplating a seven-hour day for an indefinite period, in order to retain its help, rather than let men go at this season, when it would be a great hardship for them to be unemployed.

The workers in interior lighting fixtures, chandeliers and office fittings of brass and other metals find trade very quiet, but do not appear disturbed regarding the prospects for the coming year, even though they feel compelled to admit that business has slowed down appreciably.

David Goldwasser, manufacturing jeweler, of the Jewelers building, states the case as it is viewed by many members of the industry by saying that he is less optimistic for the year 1914 than he was at the beginning of 1913.

"During the past year," said he, "the cost of living has increased. So has cost of production, because of higher prices for material and advances in wages on every hand.

"It seems to me that it must be demonstrated to producers that there will be a greater surplus in 1914, after providing for actual necessities, than there has been in 1913, before they will be warranted in increasing their output or expecting demand to broaden."

One of the significant features of the turn of the year in Boston is the report received from the State Free Employment Bureau. Supt. Sears states that on Monday and Tuesday of this week the total number of applicants for work registered with the bureau in the two days was 4,913, of whom 4,146 were males, representing 101 different occupations. He adds that the increase has been very marked of late, and at the same time calls for workmen have fallen off to a daily average of about 50. The present situation is unprecedented in the seven years' history of the bureau.

The Boston Nickel Plating Company has added a japanning and enameling department at its plant on Portland street. The New Haven Equipment Company has installed three sprayers and special ovens, and there is no better equipment in the city for the work that is to be turned out. Naturally the concern looks forward to a prosperous year with this important addition to its business.—J. B.

ATTLEBORO, MASS.

JANUARY 5, 1914.

The prospects for 1914 business depend wholly on the views of the manufacturer you talk with. There are many opinions, widely different, as might be expected from a puzzling situation. The pessimist points to the general decline of business in the metal trades and sees not much money in sight for luxuries. The optimist says that as Christmas stocks were small the retailers were never so well cleaned out as now, and that there will be a good rush of business in filling the shelves again.

Collections the first week in January are reported fair. The buyers surprised the trade on their last trip to Providence with the size of their buying. Dun's reports the output in this jewelry district 20 per cent. less than last year. Quoted in a local paper are the following manufacturers' opinions:

E. A. Sweeney, of W. H. Wilmarth Co., Corp.: "Everything looks good for a good year in business."

Col. S. O. Bigney made a guarded prediction that a fair year faced the town.

W. H. Saart thought the prospects were pretty bright and said that the rush orders were beginning.

Robert H. Moore has severed connection with the Moore, Hollis & Wiggmore Company, which is hereafter to be known as the M-K-W Company.

Clarence L. Watson and S. M. Einstein of this town and Roswell Blackington of North Attleboro, have been nominated as directors of the National Jewelers' Board of Trade.

Owing to the parcel post business here, a large part of which is supplied from the jewelers, the receipts at the post-office for the last quarter totaled \$5,900 more than for the same period a year ago. The Attleboro Manufacturing Com-

pany is building a three-story addition, 20 x 75 feet, at the corner of Hazel and Pearl streets. The North Attleboro Board of Trade is engaged in organizing a new jewelry firm. A pledge of \$10,000 started the work.—C. C. C.

PROVIDENCE, R. I.

JANUARY 5, 1914.

The New Year brings with it the question, "What will the outcome be?" Everybody is endeavoring to put on a hopeful appearance and express optimistic prophecies regarding business conditions, but, generally speaking there is less bona fide reason for much encouragement than has been the case for several years. The past year has been one difficult of analysis. The machine trade and foundries enjoyed a fairly good year. During the earlier months all of the plants engaged in metal trades of every description were busy, but with the latter part of the year trade fell off to a great extent, and many of the concerns reduced their working forces as well as the hours of labor. It is estimated that there are more than 10,000 connected with the metal trades who are out of work with the birth of the new year.

The manufacturing jewelers and the kindred branches are reported to have experienced the worst year they have had for several years. Trade has been good with some of the shops, those making specialties or novelties, but with the great majority of establishments the annual shut-down came last April rather than three months later, and business continued depressed the remainder of the year. The buying on the spring trip of the jobbers was encouraging, and for a short time while the fall buying was on, it looked as if the year was going to round out satisfactorily. This, however proved far from the truth and the year ended in a very unsatisfactory manner.

One of the most noteworthy features in connection with the passing out of the old year was the completion by the Gorham Manufacturing Company of the \$125,000 silver service for the new Hotel Biltmore at New York City. This is said to be one of the most complete and elaborate outfits ever designed for a hotel in this country or in Europe, and every piece has been wrought and finished with all the care and workmanship of any order ever delivered by the Gorham people.

The United Wire and Supply Company, of Providence and Pawtucket, is seeking a site in the city of Cranston, and has already secured an option on a tract of land containing seven acres on the Pawtuxet river. Provided tax exemption for a period of ten years is granted, the firm contemplates the erection of a factory before July 1, and to employ therein between 250 and 500 persons. The plant in Providence is used for the production of wires, etc., for jewelry purposes, while the Pawtucket plant is operated on the production of automobile accessories. The latter plant has been conducted in day and night shifts for several months, and has outgrown its present facilities.

Emil C. Boos is proprietor of the Globe Sheet Metal Works, 312-314 South Main street, Providence, according to statement filed at the City Hall.

The new structure that is being erected for the Hope Foundry Company at Cranston will probably be ready for occupancy by March next. The cost of the building is estimated at \$25,000, which is a large sum, since a foundry requires but comparatively few partitions. The company at the present time employs nearly 100 hands at its plant in Warren, but with increased facilities expects to nearly double its force.

Much interest is being manifested by the manufacturing jewelers and silversmiths in this vicinity regarding the proposed changes in the National stamping law. Committees have been appointed by the New England Manufacturing Jewelers' and Silversmiths' Association and the National Jewelers' Board of Trade and several conferences have been held. It is the desire to frame amendments to the present law that will be equitable to every branch of the industry and at the same time protect the public from fraudulent stamping. It is also sought to secure a law under which successful prosecutions may be secured of parties violating the provisions of the law.—W. H. M.

NEWARK, N. J.

JANUARY 5, 1914.

On the whole the year of 1913 has been a quiet one for the jewelry trade in the manufacturing line. The 10 karat and cheaper grades have been fairly good, but the high class lines, such as 14 and 18 karat gold and the platinum goods have been slow. Platinum goods have even sold better than the high grade gold goods as the demand has been for the cheap and the finest lines. Plated goods have also been in good demand. Platinum is not as strong as it was a year or two ago, as no one knows what platinum jewelry is, there being several alloys used. Real platinum jewelry ought to be alloyed only with iridium, which makes it harder and not more than 5 or 10 per cent. of the latter. Much so-called platinum jewelry has been sold as such, which was alloyed as high as 90 per cent. of nickel or silver and could not really be called platinum, yet sold as such, because of the fact that there is no law covering platinum, similar to the laws covering gold and silver. Agitation is now being made for such a law, which would not allow less than 90 per cent. of platinum in jewelry to be sold as such. When this is passed, it will tend to strengthen the platinum lines as people then can depend on what they are buying.

The gold and platinum lines that have been in demand are as follows: La vallieres, rings, bracelets, earrings, stick pins, cuff buttons, necklaces, brooches, etc. The manufacturers of watch cases and materials have not really been busy, but there has been a slight improvement. The bracelet watches have had a great run. The factories making jewelers' findings have been fairly busy. Some of the firms making tools and machinery have been busy all the year.

The demand for sterling silver goods has been of moderate proportions. Silver plated lines have sold well. The platers here had only a fair year and at times they have been quiet, but many large firms having their own plating plants have been busy. The engraving lines have been slow, as the hand work has to a certain extent been superseded by engine turning, the latter having been very busy. The enamellers have had a moderately good year, colorers fair, stone settlers moderate, diamond and lapidaries doing fairly well.

The refiners and smelters have had quite a good year, this being a large center for these lines. Several firms have made enlargements. The manufacturers of chemicals, acids and jewelers' and platers' supplies have had an off year but have not complained a great deal. Brush manufacturers say the trade has been very slow all the year and the demand for buffs is less than usual. The crucible manufacturers have placed a fair amount of melting pots. The demand for chasing is not as strong as in years past. The making and cutting of jewels, black diamonds, agates, sapphires, etc., has been a growing industry here, but it is said, will be hurt by the tariff. These jewels are used in watches, for meters, scales, and to make diamond draw plates.

The making of ivory goods has been carried on to a large extent here, but for buttons the real ivory is so scarce and high in price that it has given way to the vegetable ivory, which is cheaper and proves a valuable substitute. As to ivory used in the works of art and for canes, umbrellas, etc., the stag, moose, walrus and other horn has been used instead and are in demand. The pearl business is like a beehive in this city and generally the factories are very busy, but this year the strike killed off the trade. The ocean or mother-of-pearl shell is used to a great extent in high grade and cheaper jewelry and is a coming favorite.

Novelties made of brass and bronze have had a ready sale, and aluminum goods have had a good demand. White metal is also called for. The German silver lines have been strong, such as mesh bags and vanity cases. The watch trade has been a little slow, the same with watch cases and materials. The chain trade has been slower, as competition is stronger. The machine made chain is superseding the hand made and prices have lowered every year. The manufacturers of brushes for these trades have had a slow year. This applies to bristle, brass, steel and other kinds. Gold fountain pens have had considerable demand. The gold, silver, brass and bronze casters have not had a good year. The manufacturers of gold spectacle and eye glass frames and mountings and other optical lines are on the increase in this city. The repair shops have been quite busy in the line of jewelry and silver goods.

The foundries have done fairly well and the manufacturers of copper, brass, aluminum, tin, etc., have had a moderately good year. It is a question as to how much better the coming year will be, but the year of 1913 has not been good, due to the decreased buying all around, the effect of the tariff, and the production of all lines has somewhat slowed down.—H. S.

PHILADELPHIA, PA.

JANUARY 5, 1914.

This has been a quiet year for the manufacture of jewelry in Philadelphia. The various plants have not only turned out less than usual, but have been more careful than ever as to who they sell goods to. A few lines were rushed at the holiday time, but not so the manufacturers. They are taking things easy, waiting to see what the new year will bring forth, good or evil. It is hoped for the good, but there are many pessimists in the bunch. Buyers are very careful as to stocking up. It is harder to sell goods, harder to get the money due and this applies to the production of raw materials, machinery, the manufacturers, jobbers, retailers and the consumer. The continued high cost of living is being felt and this has made everybody cautious as to buying, and when they do buy, many are preferring the cheaper lines, which may last as long as the expensive goods and cost much less.

The demand for silver and German silver lines has been fairly good. The watch case trade has been slow, all kinds of materials, machinery and supplies not really strong, but a fair trade. This city is strong for the metal lines. There are many firms jobbing the raw materials and products for the brass, tin, copper, aluminum, solder, lead, gold, silver, platinum and zinc lines and they have done a moderate business. The manufacturers using these metals have not stocked up but have reported a fair demand all the year. This place is a large manufacturing center and if business continues to improve and conditions right themselves, the year of 1914 ought to be a good one. But there are many who say they do not look for any improvement. This city and throughout the state were hit somewhat by the new tariff law and it will not help matters much.

The jobbing trade has been slow also, but they are trying to push matters ahead by holding trade excursions throughout the state. The outlying suburbs are constantly being added to in the way of factories as property is going up in the city. Factories are moving from time to time to Camden, N. J., Chester, Pa., and other places between and out beyond Frankford, Kensington and Germantown. Considerable money is saved that way in property, taxes, etc. It does not pay for these plants to go to some towns because it makes it very hard to get the right kind of labor.—H. S.

BALTIMORE, MD.

JANUARY 5, 1914.

There is not much made in the gold or platinum lines in this city. Silver goods are made on a large scale, but none of the factories have been rushed. German silver lines have been fairly good. There is some plated hollow ware made, but it has been slow. The brass and bronze line is fairly strong here and business has been quiet with the foundries and factories. The plating plants have had only a fair business. The brass and copper lines are growing. Some aluminum is used, and this line admits of greater possibilities. There is not much smelting or refining business here and it has not increased any.

The one line that is growing fast here is the manufacture of tinware. This line is a big one and is growing every year. The production is very large and this city is a heavy user of tin plate. New factories are going up now and others are being enlarged. The tin plate concerns are well represented here. The tin ware that is made here is largely for the canning and the tobacco lines.

Baltimore as a jobbing center is growing from year to year and the south is the field catered to. An aggressive campaign is carried on among the merchants and twice a year thousands are brought here, their fares being paid. This strongly benefits the metal lines made, as well as the raw materials, machinery and supplies.

The year of 1913 on the whole has not been satisfactory, col-

lections have been slow, it has been difficult to sell goods, longer credits are wanted, which is a bad feature, and some speculative business is being carried on in buying and selling. There is just as much money in the country, but there seems to be a stringency and people are slow to take hold. There is an uncertainty prevailing in all lines and capitalists hesitate to start new enterprises or enlarge. No one will know for a year or two as to whether the tariff law will have a bad or a good effect as a whole. It is reported that the tariff on tin plate will hurt the American market, but while lower tin plate would benefit Baltimore, it would hurt the tin plate industry in Pennsylvania, West Virginia and Ohio.—H. S.

WASHINGTON, D. C.

JANUARY 5, 1914.

There are no large factories here making jewelry, but there are quite a number of firms having small plants, making gold and platinum lines and doing repair and special order work. These firms employ from five to thirty hands and keep busy the year around except in the summer. There is a considerable demand here for jewelry made to order for the diplomats, Congressmen and visitors. Novelties and souvenirs have a large sale. Large factories are not encouraged as they emit smoke, and this is a residence city and the seat of government. Some small firms are trying to work up a demand for hand-made jewelry, and while it sells, it is hard to educate people up to individuality in articles of adornment, the machine made lines answering the purpose. Most of the articles made to order are in the nature of rings, la vallieres, bracelets, earrings, etc.

There is practically no jobbing business here. There is a great deal of retailing, and they all report a very slow trade for the year of 1913. It is said to be one of the slowest ever experienced.

The proposition to beautify the city is going ahead, and will in time make this place a paradise. Rock Creek Park and a boulevard system is expected to be continued on down to the White House. The mall will be widened from the Capitol to the White House, all the buildings to be torn down on the south side of Pennsylvania avenue, where all the future public buildings and embassies will be erected. The many houses and buildings are being torn down between the Union station and the Capitol, to be used in a general beautifying scheme for that section.

There has been talk at times of a big exposition to be held here, but nothing definite has ever developed. There is also a proposition on foot now to hold a permanent exhibition for American made products. Another project is expected to go ahead, that is that an exhibit of silverware is expected to be installed by the manufacturers around the country in one of the hotels here, which would be a permanent feature.—H. S.

LOUISVILLE, KY.

JANUARY 5, 1914.

While the customary holiday let-up in business generally has been faithfully reflected in the various departments of the metal industry in this section, most of the trades are optimistic in their predictions regarding business in 1914. The manufacturers of distiller's supplies are especially inclined to look for an active spring business, in view of the fact that repair work was usually short during the fall season, largely because most of the distillers, it seems, look for a short crop. They therefore decided, in many cases, to put off general repairs until operations cease in the spring. The recent advance in the price of copper has not affected local conditions, as little material is being used at this time, and most of the concerns using it are protected under contracts.

The two big jobs of the years with the coppersmiths in Louisville were the Corby distillery job handled by Matt Corcoran & Company at Corbyville, Ontario, and the roofing of the Louisville Federal building, which was handled by Fred F. Schupp, and called for 7,000 pounds of copper. Aside from these, most of the work was small.

C. J. Thoben, of the Vendome Copper Company, stated recently that while work is rather slack at present, being hardly

more than sufficient to keep the men at work, prospects look very favorable for spring business.

The Independent Brass Foundry, composed of J. W. Rademaker and Charles Schadt, at 437 South Center street, which handles metal castings of all sorts, has been doing a satisfactory business, according to one of the members of the firm, plenty of odd jobs of molding developing around the city. The company is using a new composition metal known as silver bronze, for which it has the local agency, with considerable success. It takes a high polish, similar to nickelplated work. The firm has been in business only about six months.

The Louisville branch of Ahlers & Gregoire has been kept fairly busy during the past few months, although business has not been what it should be, according to George F. Ahlers. The tendency noted among the distillers to get along during the season without any more repairs than absolutely necessary accounts for this, but, as Mr. Ahlers pointed out, this will result in more active business when the summer shut-down comes.

NEW ALUMINUM PLANT

The Aluminum Company of America, whose general offices are in Pittsburgh, and whose search for a suitable location for an immense plant in Tennessee caused much competition on the part of various cities in that State for the plum, announces that it will utilize a tract of 600 acres at Maryville, Tenn., for a site for 41 buildings which will ultimately compose its plant. Two buildings, 341 by 40 feet, of steel construction with concrete foundations, are nearing completion, and a power-house, 220 x 40 feet, is under construction. Other buildings will shortly be started. The company has contracted with the Tennessee Power Company, of Nashville, for 20,000 electrical horse-power, and the latter company is now constructing the necessary transmission lines from its plant.—G. D. C.

COLUMBUS, OHIO

JANUARY 5, 1914.

The metal market in Columbus and Central Ohio is more firm and there is a tendency to strengthen all along the line. This is especially true of brass, copper and other metal lines with the exception of aluminum which is still a drag on the market. Apparently the effects of the recent tariff changes are now being overcome and the market is becoming settled again.

Relative to the future all metal using concerns as well as jobbers believe that the coming year will be fair. They say that the consumption of all kinds of metals will be good and prices will recover some of their lost ground. All of the metal using concerns in this territory are being operated despite the business depression which prevails. There is talk of opening several new concerns which will be in the market for brass, copper and aluminum.

Brass is stronger, both for scraps and bars. This is also true of copper, both red and yellow. Babbitt metal is moving fairly well and prices are firm. Tin and solder are stronger and other metals are unchanged from the previous month. Brass and specialty manufacturers in Ohio will be affected by the workmen's compensation law which became effective January 1. Under the law all employers of five or more laborers will be compelled to pay into a fund under the control of the State Board of Awards a certain percentage of their annual payrolls to take care of deaths and injuries of their employees.

The D. A. Ebinger Sanitary Manufacturing Company which operates a plant for the manufacture of plumbing articles and drinking fountains at 180 Lucas street, has put in a new enameling furnace and increased its floor space to a large extent.

The American Stamping & Enameling Company, of Bellaire, Ohio, recently incorporated by the Geiger-Jones Company, and which is consolidated with a number of other enameling and stamping concerns, is planning to build a large enameling plant in Massillon to employ 500 men. It is planned to conduct a large string of enameling concerns and others will be established later. The Columbus Welding Shop located at 294-296 North Third street, Columbus, Ohio, is the name of a new concern opened to do repair work on automobiles. The Bunting Brass & Bronze Company, of Toledo, Ohio, which was started seven years ago at Alliance, Ohio, has secured a large foreign order. It exports to South Africa, Canada and South America. During

the past year, 12,000 finished bushings have been shipped each day from the plant.

The Board of Trade, of Niles, Ohio, has closed negotiations with the Wilson Manufacturing Company for the purchase of the building and site on Erie street, formerly occupied by the Economy Lamp Company. The Wilson Manufacturing Company will manufacture sheet metal specialties, including the Wilson Accommodation oven, cookers, ventilators and other domestic devices. H. P. Knoblock is at the head of the company. The Mebane Manufacturing Company, of Cleveland, Ohio, has filed papers with the Secretary of State changing its name to the Case Hardening Service Company. The Sanitary Company, of Cleveland, Ohio, manufacturers of plumbers' brass goods and plumbers' fixtures has filed papers with the Secretary of State, increasing its capital stock to \$100,000, and at the same time changing its name to the Paragon Brass Manufacturing Company.

The Meyers Specialty Manufacturing Company, of Findlay, Ohio, has been incorporated with a capital stock of \$5,000, to manufacture and deal in plumbing fixtures of all kinds. The incorporators are Earl L. Myers, Ross A. Bailey and M. A. Fenelly. The new plant of the John W. Brown Manufacturing Company, located on Marion road, Columbus, Ohio, has been completed and machinery is now being installed. The plant manufactures lamps exclusively for the Ford Company.

The Parish & Bingham Company, of Cleveland, Ohio, obtained permission to increase its capital stock from \$244,000 to \$1,000,000. The Company's factory is at 5363 Hamilton avenue and it manufactures auto frames and steel stampings. The increase was obtained for the purpose of increasing working capital.—J. W. L.

BUFFALO, N. Y.

JANUARY 5, 1914.

Buffalo is growing as a manufacturing center and several additions have been made to the factories making brass, bronze and other lines. A fair business has been done this year. The foundries and factories have done fairly well. The product of tin ware has increased; brass and bronze art novelties also; silver and German silver about the same. Aluminum goods are in demand and copper sheet, wire and rod have been called for in the usual amounts. The production of these lines is on the increase probably, although the past year was not as good as others before that.

The plating lines have been growing and the art metal goods have increased. The jobbing business in all lines has been quite good and the territory sold in has been gradually enlarged upon. There is considerable demand for hand wrought brass and copper goods and for hand-made gold and silver lines, set with precious and semi precious stones and pearls.

The smelters have done quite well, this city being a center for such a large and varied line of industries that most all of them cater more or less to the metal trades. A large business is done in scrap metal here, several firms being engaged in it. The manufacture of optical frames and other supplies is enlarging here every year. Buffalo expects a largely increasing trade when the Erie barge canal is completed, as it will facilitate the bringing in of raw products and the shipping of manufactured goods. Several firms will exhibit at the Panama Exposition at San Francisco in 1915, and the San Diego Exposition the same year.

Buffalo is noted from coast to coast as a ring manufacturing center. This is a 10 karat gold city and the making of these rings is carried on extensively and the product made is very large and increasing. There are about a dozen large factories, having the best of facilities and using the most approved methods. There is not much else made in the gold line but rings and there are no high grade rings made here of gold or platinum. The product that is turned out is excellent for the quality advertised. These firms have from time to time enlarged and built new plants.—H. S.

DETROIT, MICHIGAN

JANUARY 5, 1914.

Ever increasing prosperity is the promise of Detroit brass, aluminum and other manufacturers for 1914. Nowhere is there any doubt of good business for the new year which includes a substantial increase over 1913. Practically every manufacturer

reports his business for 1913 showed a satisfactory increase over the preceding year. To prove this forecast is true, Abner E. Larned, head of one of the largest overall manufacturing plants in the city, states that when factory conditions show prosperity, his plant is sure to feel the results. Idle men, he states, do not buy new working garments, and consequently his factory feels the effect of any depression. "Just now we are doing an excellent business," he states, "which shows that brass, aluminum and automobile factories in Detroit and other cities, are fairly prosperous and forecasts a bright future in these lines of trade, as well as in many others."

E. St. Elmo Lewis, advertising manager of the Burroughs Adding Machine Company, a concern that uses large quantities of brass and aluminum, says:

"The biggest year in our business was in 1913. In the eleven months up to December 1, we eclipsed month by month the preceding year. Our December business in 1912 amounted to \$1,040,000 and this December we will have far exceeded those figures. We are preparing for a bigger year than ever before. Our business in 1913 was an increase of 15 per cent. over the year previous, and we predict a greater increase in 1914."

Harry G. Drefendorf, general manager of the Gray Motor Company, says:

"We believe business next year will be good, perhaps not a record breaker, but a year of healthy business. For the last three months we have been inclined to be conservative, and our business in marine engines will not be heavy for a few weeks, on account of the season. The demand for farm engines is steady, and with good crops throughout most sections of the country we expect an increase in this line."

James Cousins, vice-president of the Ford Motor Car Company, says the prospects for the automobile industry in 1914 are so good that he does not see how they could be better. This company uses more brass and aluminum in its output, it is stated, than any other similar concern in the country. He states it will keep the company busy through 1914 to bring their facilities up to the demand. This company is employing fifty per cent. more men at this time than it did last year during the same period. "Our output for 1913," he states, "was 150 per cent. above the 1912 production, and the 1914 production will be 50 per cent. above that. With such an outlook in the automobile industry, no one has cause to fear lack of prosperity in Detroit during the coming year."

While the manufacturers of plumbers' supplies and others engaged in the brass and aluminum trade, are not all so optimistic as some of the manufacturers quoted, none seem to feel doubt

regarding the outlook for the coming year. It is quiet now in most of the latter manufacturing plants, but this is believed to be only temporary and within the next month or so a decided improvement will be noted.—F. J. H.

TORONTO, ONTARIO, CANADA

JANUARY 5, 1914.

The year of 1913 has drawn to a close and most of the manufacturers say that business is not as good as the year before, although somewhat better than that in the States. This is due to the big booms which have been going on in Western Canada. The manufacturers in the metal lines are well represented and they speak well of the future prospects. Canada is under a high protective tariff system and it has tended to foster the industrial pursuits. There are a considerable number of manufacturers in copper, brass, bronze, tin, gold, platinum, silver and German silver. All of these lines are increasing and very good prices are obtained.

There are a lot of jewelry factories here making from 10 to 14 karat gold goods and they have been busy. The platinum lines have also done well. Gold plated lines have been in demand. Enameled jewelry sells very well over here. Britannia ware manufacturing is on the increase. Watch cases, materials and supplies have done well, especially the bracelet watch, which has had a phenomenal demand. Mesh bags and vanity cases have sold strong. The platers have been increasing here and have done very well, and platers' supplies and chemicals sell readily. This has been a strong field over here for all lines. Years ago the manufacturers were small and using antiquated methods, but of late years Americans have come in and revolutionized all the industries.

Toronto now has about 450,000 population and is growing fast as a metropolitan city. Its industrial growth has been rapid and of a permanent nature. Some have built new factories, others have enlarged. The same reports come from Montreal, Quebec, Ottawa, St. Johns, Hamilton, Winnipeg and Vancouver.

The Canadian Exhibition held here every year has been the means of putting Toronto on the map and has not only made this place known throughout the world, but has brought factories here and helped greatly in boosting industrial Toronto.

Toronto is expanding commercially and has a bright future. The jobbing of all lines is carried on in large proportions and as a center for this traffic, this city is right to the front.—H. S.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Nelson Manufacturing & Supply Company, Hutchinson, Kan., is erecting a brass foundry and tank shop.

The Maryland Brass & Metal Works, Baltimore, Md., will erect a two-story brick addition, 46 x 78 feet, to its brass foundry.

The Waterbury Clock Company, Waterbury, Conn., have awarded the contract for the erection of a five-story factory, 50 x 182 feet.

The Raritan Copper Works, Perth Amboy, N. J., manufacturers of electrolytic copper, are building an addition to their office building.

The Nichols Copper Company, New York, have let the contracts for a \$50,000 addition to its plant at Laurel Hill, L. I., N. Y., on Brook avenue, south of Creek street.

The Merserau Metal Bed Company, Jersey City, N. J., will put up a building of 6,000 square feet for a polishing room. This company also operates a foundry, metal working and machine shop.

The Ansonia Brass & Copper Company, Ansonia, Conn., will erect a two-story addition to its factory on Factory street. The building will be of brick and steel, fireproof and will be 60 x 440 feet.

The Danzer Metal Works, Hagerstown, Md., has almost completed the erection of a double warehouse adjoining their present factory on Lee street. The company operates a sheet metal working shop.

Max Schweizer, 230 North avenue, Bridgeport, Conn., who does a large business in etching silverware, cutlery, clock dials, etc., is now specializing in pierced etching and has many fine examples of this work in various metals on exhibition at his office.

Part of the Lyndonville Electro-Plating Works owned by H. F. Stahler has been altered and equipped with machinery to do general auto repair business under the name of Stahler's Garage, Lyndonville, Vt. The plating business will be continued as before.

The United Metal Manufacturing Company, New York, will move its business to Norwich, Conn., where it will occupy the plant recently vacated by the Sterling Machine Company. The company manufactures brass fittings and other metal specialties.

John C. Wiarda & Company, 263 Green street, Brooklyn, N. Y., manufacturers of chemicals and platers' supplies, announce that they have greatly increased their capacity for manufacturing nickel anodes and are now in a position to make better deliveries than ever before.

At the First International Exposition of Safety and Sanitation held recently in New York, the American Abrasive Metals

Company were awarded a gold medal diploma for their feralun safety treads, which have extensive uses for anti-slip surfaces where people must walk.

The Waynesboro Metal & Poultry Company, Waynesboro, Pa., manufacturers of brass and bronze castings, etc., is erecting an addition 43 x 60 feet to its present plant, in which it will install a smelter and a reverberatory furnace for reclaiming and refining its own brass ingots.

The Dietz-Roemer Brass Company, Baltimore, Md., which recently acquired a lot on the Fallsway, in the rear of 213 Harrison street, are going to erect a brass foundry 25 x 75 feet and will be four stories high on Harrison street and three stories on the Fallsway. The building will be of reinforced concrete.

The published report that the Doehler Die Casting Company contemplated moving their Brooklyn, N. Y., plant to Toledo, Ohio, is incorrect. The Doehler company announce that their plant in Brooklyn will remain, as such a move has never been considered, but that they are merely opening a branch factory in Toledo.

A. H. Anderson, 1215 Fulton street, Chicago, Ill., is building a brass foundry in addition to his present plant. It will be one and two stories, 25 x 120 feet, and will cost about \$6,000. New improvements will be made to the equipment and when ready, which will be about January 15, they expect to have the most modern equipped job foundry in that part of the States.

The Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y., has made arrangements for representation in the Middle West with A. C. Dallas & Sons, Inc., 223 North Jefferson street, Chicago. They will handle all of the products of the Buffalo Copper & Brass Rolling Mill, such as sheet copper, copper in rolls, copper flats and bottoms, copper anodes, sheet brass and brass rods and wire.

Kann & Wysor, specialists in analyzing metals, alloys and metallic residues, announce that they have doubled the facilities of their analytical laboratory at 62 Gold street, New York City, to take care of the growth of their clientele and are in a position to give prompt and accurate results at reasonable rates. The firm also represents shippers of copper, lead or zinc bearing material in sampling and weighing at refineries.

The Gallagher Carburetor Company, 1876 Broadway, New York, on account of increase in business have purchased the Edwards & Smith Company foundries of Easton, Pa., and will operate under the name of Lehigh Valley Foundries & Manufacturing Company, with main offices in Easton, Pa. The company will manufacture valves, brass and aluminum castings of all kinds. The New York office will be continued at the same address, 1876 Broadway.

The Cassady-Fairbank Manufacturing Company, Chicago, Ill., report that they have just bought the plant of the East Side Foundry Company, of South Chicago, Ill., and have moved it to their main mill. They state through H. J. Cassady, president, that the regular line of hardware specialties and automatic machine work will be continued and that they will specialize in the manufacture of the white metal known as the "Comet" non-corrosive white metal. They will also cast brass, bronze and aluminum in a department which is in charge of P. D. Malloy, metallurgist.

The Abbott Ball Company, Hartford, Conn., are building a large addition to their factory. The building measures 50 x 120 feet and is of steel, brick and concrete construction. This new building will be devoted to the manufacture of ball bearings, a line which the Abbott Ball Company planned to manufacture when the company was first organized, but which, on account of the rapid growth of their ball burnishing equipment business, they have been unable to develop. The increase in their facilities will now enable them to take care of both their old and new lines in a first class manner.

The Charlotte Plating and Brass Company, Charlotte, N. C., is now in complete operation and is turning out all kinds of tableware of brass, aluminum, etc. The plant is being gradually enlarged, an addition now being in process of construction in order to permit of the consolidation of the plating equipment, which has heretofore been located some little distance from the main plant. The uniting of the foundry and plating works under one roof will permit of more efficient and speedy work. The present product of the plant is 4,000 pounds of brass casting per day, but this can be increased to 100,000 pounds daily if occasion demands.

The H. S. Wyckoff Company, of Newark, N. J., manufacturers of polisher's and plater's supplies, have been compelled to increase their plant owing to the increased sales of the "Wycko Brand" of nickel salts and Vienna lime finish. The "Wycko Brand" of nickel salts, it is claimed, not only gives a homogeneous deposit in about 50 per cent. of the time that the regular salts do, but the work will come from the bath more like silver than nickel. The H. S. Wyckoff Company's Vienna lime finish is made for all classes of coloring and is made in such a manner that it leaves the work clean, saves not only time for the manufacturer, but brings up a white surface to the metal, giving same a lasting luster.

The Roessler & Hasslacher Chemical Company, New York, announce that they have decided to manufacture on a commercial scale and to introduce to the market in connection with their triple plating salts "Trisalyt" the cyanides of silver and copper. These cyanide salts of silver and copper are put on the market for replenishing purposes, as they contain the highest possible metal content and a very low percentage of cyanogen. Silver cyanide contains 80.5 per cent. metallic silver, and the copper cyanide 70 per cent. metallic copper; they contain absolutely no inert material, the balance being cyanogen. Thus the trisalyt solutions, which, under these conditions develop free cyanide above mentioned, can be brought to standard with the use of these salts, after which trisalyt can again be used for replenishing.

A new platinum melting and welding device called the "Phoenix" has been put on the market by the Jewelers Technical Advice Company, 12 John street, New York City. This apparatus has a capacity of melting 150 ounces of platinum at one time, or it can be used for any smaller quantity. The Jewelers' Technical Advice Company make a specialty of furnishing information relative to all the processes of refining, plating, coloring and other manufacturing operations as related to jewelry. They state that they teach the best processes of refining gold, silver and platinum, melting metals, alloyings, and have developed a real gun-metal finish on gold or silver, a method of making silver untarnishable without lacquer, and numerous other improvements. They also undertake the systematizing of jewelry factory operations. Sam Hoke is the manager of the company and C. M. Hoke, B.S., M.A., is connected with the company in the capacity of consulting chemist.

Consolidation has been made of two of the oldest and most prominent hardware concerns in Philadelphia, Pa., under the new corporation name of the Supplee-Biddle Hardware Company. The combining firms are the Biddle Hardware Company, of Fifth and Commerce streets, and the Supplee Hardware Company, of Fifth street above Market street. The new concern is incorporated for \$1,000,000 and will be the largest wholesale hardware distributing house along the Atlantic coast. The corporation will be located after the merger in the present building of the Biddle Hardware Company heightened to eight stories and five additional buildings, three on the east and two on the west adjoining the present structure. This will give them the largest and most up-to-date hardware house east of Chicago. Modern equipment in the new buildings will permit of economical and rapid handling of merchandise.

The Biddle Hardware Company, known to the mechanical and manufacturing world as the distributors of Monel Metal, was organized by R. and W. C. Biddle in 1837 and occupied a small building on lower Market street fronting on the old public market. Charles M. Biddle, the present head of the company,

entered into the partnership one month before his twenty-first birthday, and in 1873 became the sole owner of the business.

AMERICAN BRASS CO.'S NEW OFFICE

Opposite the Union depot, whose great tower casts a shadow on some part of its front throughout the afternoon of every sunshiny day, the new office building of the American Brass Company welcomes the visitor to the Brass city with an architectural charm that is pleasing. This building is not as pretentious as one in white marble would be, but it is like the industries of the Naugatuck valley, more durable than pretty. It is mighty attractive inside, however, and its external attractiveness is sufficient to make it a welcome addition to the new center of the city. It stands a stone's throw from the site for the proposed new \$400,000 city hall, but examination quickly leads one to the conclusion that its erection cost the American Brass Company much more than the proposed municipal building is estimated to cost.

The main entrance has a handsome set of brass and glass doors. The brass work is exemplary of the artistic side of brass manufacturing. The glass panels permit a view of the elegant marble stairway and the large transparent clock that presides over the lobby. The floor of terrazo brick woodwork and furniture of mahogany, cream colored ceilings and side walls



AMERICAN BRASS COMPANY'S NEW OFFICE,
WATERBURY, CONN.

lend an air of elegance to the main corridor that is worthy of the institution. The executive offices and private offices of the company's officers are on the first floor. The general offices and telephone exchange are on the second floor. The exchange connects fifteen hundred telephones in the various plants of the company, throughout the state, and is one of the three largest private exchanges in the state. It is worked by four operators.

There are a fine drafting room, a library, eighteen office rooms and dressing rooms for employees on the third floor.

The basement contains an excellent heating plant, a splendid garage for the cars of the company's officers, and a large storage room.

One unexpected characteristic of the building is that it performs the functions of a sun dial during the latter half of the day. As the office employees are returning from lunch at 1 p. m., they find the northern edge of the front of the building darkened by the shadow of the lofty tower of the railroad building across the street. This shadow stretches three hundred feet to caress the new office building, and it slowly travels from north to south along its face until it is lost on the curving end of the building as the shades of evening fall. The offices were occupied during the past month.

FIRES

The Thomas J. Dunn Company report that the fire which occurred in their factory building at 101 Chambers street, New York, on December 30, 1913, was confined to the upper loft, the damage being mostly done by water. The plating and polishing department on that floor was flooded with water, and considerable damage was done to solutions, tanks and dynamos. The lacquering room, which was built of sheet steel, withstood the terrific heat and was probably

the means of saving the balance of the plant. The estimated loss is about \$15,000, which is fully covered by insurance. It is noteworthy that the steel walls of the lacquering room kept the flames away from the quantities of lacquer and saved the plant, thus proving the necessity of such a room in all plants of this kind. This room was suggested and constructed under the supervision of the superintendent of the plating and polishing department, Royal F. Clark.

INCREASE IN CAPITAL STOCK

The Waterbury Brass Goods Corporation, Waterbury, Conn., has issued 1,280 shares of stock, increasing its total capital to \$500,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

To deal in metals, ores and their products.—D. Houston & Company, Inc., 220 Broadway, New York. Capital \$10,000. Incorporators: Robert J. Houston and Ralph O. Houston.

To make castings of non-ferrous metals and alloys.—Schnell Bronze Bearing Company, Buffalo, N. Y. Incorporators: Fred Schnell, Allen Schnell, William Mittling and C. L. Bullymore.

To specialize in brass and aluminum automobile accessories.—New Brass Works, 835 Superior street, Detroit, Mich. Incorporators: John B. Schmandt, president, and H. T. McClune, secretary.

FOREIGN TRADE OPPORTUNITIES

[In applying for addresses at Bureau of Foreign and Domestic Commerce, Washington, D. C., refer to file number.]

No. 12155. Machine Tools and Electro-Technical Goods.—A report from an American consular officer states that a foreign business firm wishes to be placed in communication with American manufacturers of machine tools and electro-technical goods with a view to obtaining an agency in Germany for such machinery.

No. 12158. Plumbers' Supplies.—A firm of wholesale dealers in plumbers' supplies in a Canadian city informs an American consular officer that it desires to be put in communication with American manufacturers of plumbers' supplies of all kinds, and particularly plumbers' brass goods, such as taps, etc., sanitary pottery ware, sanitary drinking fountains, sanitary enameled iron ware, such as basins, sinks, etc. This firm desires to buy outright, and if satisfactory arrangements can be made, will be willing to act as local agents. References are furnished.

PRINTED MATTER

Escutcheon Pin Measure.—John Hassall, Inc., Brooklyn, N. Y., has issued a complete little table whereby the approximate number of brass, steel or aluminum escutcheon pins to the pound can be ascertained. This is claimed to be the only list of its kind published and the firm would be glad to respond to inquiries for copies of same.

Metals.—I. Shonberg, Brooklyn, N. Y., manufacturer and dealer in type metals, "M. M." white bronze for high speed and heavy pressure bearings, has issued his annual calendar for 1914. This calendar is 18½ x 23 inches, composed of twelve sheets and each sheet contains a description of some one of Shonberg's well known brands of prepared metals such as type metals, babbitts, etc.

Air Brushes.—The Eureka Pneumatic Spray Company, New York, have issued a little booklet giving complete description

of their extensive line of sprayers. This booklet contains also a description of the Eureka double acting air compressor and the air receivers that are used in connection with the various types of sprayers and brushes manufactured by the company. Copies of this little booklet may be had upon request.

Metallic Cyanides.—The Roessler & Hasslacher Chemical Company, of New York, have issued a handsome calendar embellished with a photogravure of a Grecian water scene, in the interests of sodium and potassium cyanide which they manufacture at their Perth Amboy, N. J., works. This calendar also contains the latest International atomic weights of the elements, which thus makes it a handy reference for the chemist and plater.

Mineral Cleaners.—The Electric Smelting & Aluminum Company, manufacturers of Mineral Cleaner, Lockport, N. Y., have issued a handsome little booklet which gives full explanation of what Mineral Cleaner is and what it does. This booklet also contains some valuable information in the way of directions for using Mineral Cleaner and any one interested in the work of cleaning metals before plating should send for a copy.

Foundry Machinery.—The first issue of the Exhibition Quarterly published by the Foundry and Machine Exhibition

Company, Chicago, Ill., has been issued. The Quarterly gives an account of the Foundrymen's Convention and Exhibition that was held in Chicago in October, 1913, and also gives a few notes in reference to the plans for the exhibition of 1914, which will be held also in Chicago, while it is predicted that the exhibition of 1915 will be held in the East.

Copper Products.—Hendricks Bros., Inc., New York, have issued their annual diary for 1914. This little diary is leather covered and contains, besides the space for daily memorandums, a number of pages full of important information relating to the various copper products handled by this firm, which includes sheets, circles and segments tinned, also cold rolled copper, copper rods, bolts, wire, rivets, etc. Copies of this handy little memorandum book will be sent upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW FOR 1913—OUTLOOK FOR 1914

By J. J. ARCHER.

REVIEW.

In our forecast for 1913—written a year ago, we said, "Today conditions are as sound as ever and the outlook as bright as at any time," and we have nothing to take back from that diagnosis.

It was not until the monied interests of the country—the New York banks—began their insidious attack on the democratic administration and the proposed reform currency legislation by warning the trade of the country that the banks would not make further loans and advised all their customers to draw in all credits and reduce, as much as possible, all indebtedness that the business of the country began to shrink. The excuse given for this unjustifiable action was that "money in the fall was going to be very tight." The direct and immediate result of this action by the New York banks was to paralyze the confidence of the trade of the country and start a wave of pessimism that has closed factories and mills and brought others to running at less than 50 per cent. of capacity. Despite this sentimental and unwarranted pessimism the iron and steel trade of the country has passed through a banner year. The production of pig iron was over a million tons more than in 1912, and that was a record year. Manufactured iron and steel showed big increases. In other metals, copper, tin, lead, spelter, it is true consumption has suffered, owing to the general depression, and the year closes with iron, steel and nearly all other metal prices considerably lower than a year ago. The changes in the tariff have been more or less an unsettling factor, but so far no steel mills have gone out of business and Schwab has not sold his Bethlehem plant, and never intended to.

OUTLOOK FOR 1914.

The outlook for 1914 is considerably improved since the signing of the Currency bill and the fair and conciliating attitude of the administration in regard to big business became known. With the control of money and credit taken away from Wall street the business interests of the country, treated fairly and impartially, will be able to go ahead and confidence will do the rest. Basic conditions are good, stocks of all manufactured goods have been consumed, prices of raw materials are at low levels and a conservative business revival is at hand.

COPPER.

In January, 1913, the copper market opened at around 17½ cents for electrolytic. By the end of the month the price had dropped to 16 cents. During February the market still further weakened and electrolytic sold at close to 14½. In March, April and May prices advanced about 1 cent per pound; June and July prices declined again to close to 14 cents, but reacted sharply to 16 cents in August. Europe was a buyer at around 15 cents, and up to 16 the market was held fairly firm in Sep-

tember and October at around 16½. Producers held on to this price for some time, but home consumers were not buying and second hands began to cut prices. In November producers dropped their quotations to 15½, and later down to 14½. Europe began to buy again and a good export business was done. Domestic consumers held off and on account of slack trade they had enough copper carried over to last them well into December and some into January. In December the market was very weak and prices declined to close to 14 cents, while producers were asking 14½. At around this price towards the end of December the market became fairly active. Europe bought freely and domestic consumers began to come in for January and February copper, and price at the close of the month reached 15 cents a pound. This marked a net decline for the year of about 2¼ cents for electrolytic copper. The Lake copper market was more or less nominal owing to the strike, and the Lake companies did the best they could to keep their customers supplied with the metal. The strike is practically over, and the Western Federation has been beaten.

Statistically the market is in much better shape than a year ago, when we had, according to the Copper Producers' Association, a stock of over 105 million pounds against a stock today of around 91 million pounds. Total production for the year was 1,622,450,829 pounds, against 1,581,920,287 in 1912. Total deliveries for the year were 1,636,414,544 pounds, as follows: American deliveries, 767,351,760; exports, 869,062,784 pounds, against a total last year of 1,566,062,400 pounds. The consumption for 1913 was 52,314,188 pounds less than in 1912, while the exports in 1913 were 122,666,332 pounds more than in 1912.

These figures made a very bad impression in the trade.

According to the United States Geological Survey the production of blister and Lake copper was 1,223,700,000 pounds in 1913, against 1,243,268,720 in 1912.

The total exports for the year, according to the Custom House returns, were 382,110 tons against 327,965 tons in 1912.

The price of electrolytic copper is around 14½ cents, with the producers asking 14½ cents. Lake is obtainable at 14½ cents, and casting brands at 14 cents.

TIN.

The price of tin at the beginning of 1913 was 51 cents a pound, prices declined for the next two months and 45.75 cents was touched during March. April and May prices reached 50.70 cents, and from that point declined to close to 39 cents in July. During the next two months prices advanced nearly 5 cents per pound, and then declined more or less steadily to 36¼ cents in December—the low point of the year—towards the end of the month prices again advanced, but closed with a weak market at 36¼ cents.

Consumption for the year shows a decrease of over 5,000 tons compared with 1912. The shipments from the Straits increased over 3,000 tons compared with 1912.

LEAD.

The lead market has been held fairly steady during the year. Opening at 4.35, the Trust price in January, price was advanced to 4.50 in April, dropped 15 points in June to 4.35, and then advanced in July to 4.50 and in August to 4.75. October price was dropped to 4.35, ten points lower in November, and again dropped 25 points in December to 4 cents per pound, basis New York 50-ton lots. The low price for the year. Later the price was advanced 15 points to 4.15 New York and on January 9 the price was dropped 5 points by the trust to 4.10 New York.

The United States Geological Survey gives the production of refined lead in 1913 approximately 466,843 tons, against 480,894 tons in 1912, a decrease of 14,000 tons. The production from foreign ores fell off 34,000 tons, while the production of desilverized increased 34,000 tons and the net decrease is about covered by the decreased production of soft lead of 15,000 tons. It is estimated there may be approximately a surplus stock of lead of 50,000 to 60,000 tons.

SPELTER.

Opening in January, 1913, with the price of spelter in East St. Louis at around 7 cents, with 7.15 reached during that month, the price gradually declined during the entire year, except a slight reaction in July and August, which carried the price from 4.95 in June—the low point of the year—to 5.85 in August, since when prices declined again and closed at close to 5 cents a pound, or within a few points of the lowest.

The decrease in consumption and the increased production forced the lower quotations. It is interesting to note that consumption during 1913 was nearly 40,000 tons less than in 1912, while production increased nearly 7,000 tons. This leaves a stock on hand January 1, 1914, of over 36,000 tons, against a stock of only 4,000 tons in January, 1913.

According to the report of the United States Geological Survey, the production of spelter for 1913 was 345,575 tons, an increase of 6,769 tons over 1912.

With the increased smelting capacity for 1914 and the heavy stock on hand, prices for spelter would naturally tend downward rather than upward.

ALUMINUM.

The price of aluminum during the year shows a steady decline from January at around 26½ for 98-99 ingots, down to around 18¾ cents at the close. It is to be noted the duty has been reduced from 7 cents to 2 cents a pound, but even with this cut in the duty the average for the year is about 5 cents a pound over 1912.

ANTIMONY.

The prices of antimony show the general depression in business, and prices are about 2 cents a pound lower than at the opening in January, 1913. Cookson's today is 7¾ cents, Hallett's 7 cents, and Hungarian grade at around 6 cents.

SILVER.

Opening at around 63 cents, New York, the price dropped to 57 cents in March, the low point of the year. Prices gradually recovered to 61 cents in October, when prices declined again and closed at around 5¾ cents in New York, and 26¾d. in London.

PLATINUM.

The price of ordinary refined platinum has held fairly steady throughout the year at around 43 to 44 cents, with 10 per cent. hard at \$45 to \$46. Iridium has ruled from \$82 to \$80 at the close.

QUICKSILVER.

The wholesale price of quicksilver has fluctuated very slightly, opening at \$40 per flask the price today is \$38, with jobbing lots at \$40 to \$42 for smaller lots.

SHEET METALS.

The sheet manufacturers during the year followed the fluctuations in ingot copper and at the same time tried to protect their customers as far as possible. The base price of sheet copper a year ago was 23 cents, with Lake at 16¾. With Lake at 14¾

in December the price of sheets was reduced to 19¾ cents, the low price of the year. Later in December price was advanced to 20 cents and, effective January 1, price was advanced to 20¾ cents, with Lake selling at 15¾ cents. Copper wire is quotable 15¾ cents base, and high sheet brass is quoted at 14¾ cents base.

OLD METALS.

The old metal market has shared in the general depression, and business has been anything but active. At the close of the year Europe has been a buyer at the low prices, and the outlook today is brighter than a month or so ago.—J. J. A.

DECEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	15.50	14.75	15.00
Electrolytic	15.00	14.25	14.50
Casting	14.60	14.00	14.25
TIN	39.25	36.75	37.75
LEAD	4.25	4.00	4.10
SPELTER	5.40	5.15	5.25
ANTIMONY (Hallett's)	7.20*	7.00	7.10
SILVER	58¾	56¾	57.75

WATERBURY AVERAGE

The average price of Lake Copper per pound as determined monthly at Waterbury, Conn.

1912—Average for year, 16.70. 1913—January, 17; February, 15.50; March, 15¾; April, 15.75; May, 15¾; June, 15¾; July, 14¾; August, 15¾; September, 16¾; October, 16¾; November, 16¾; December, 15; average for year, 15.83.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	January 8, 1914. Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, December 1, 1913..	47,929,429
Production of marketable copper in the United States from all domestic and foreign sources during December, 1913.....	138,990,421
	186,919,850
Deliveries:	
For domestic consumption.....	21,938,570
For export	73,542,413
	95,480,983

Stocks of marketable copper of all kinds on hand at all points in the United States, January 1, 1914..	91,438,867
Stocks increased during the month of December...	43,509,438

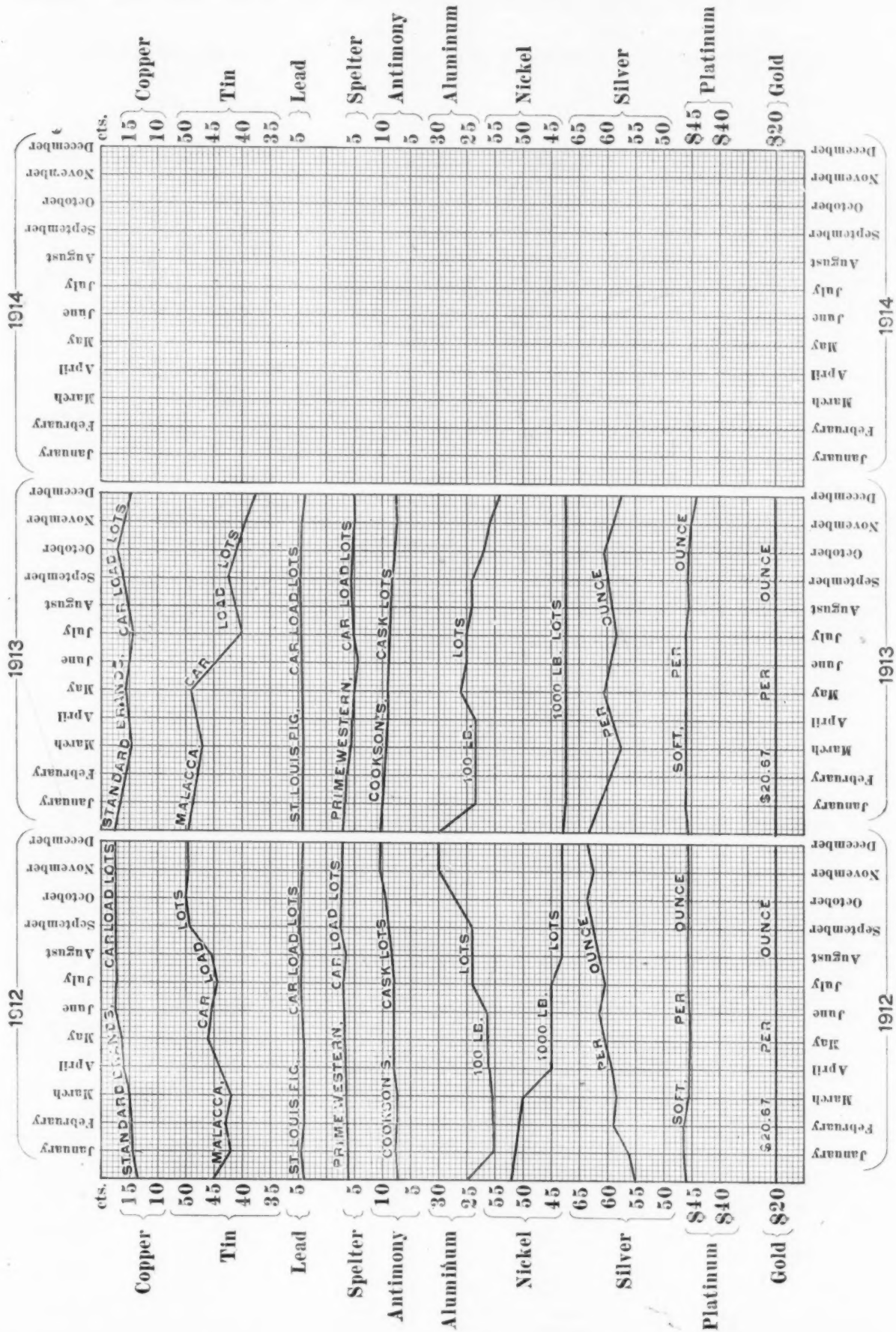
DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of \$10. The price of the Report alone is \$10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

CHART OF METAL PRICES



Pig Iron and Metal Products of the United States

Calendar Years 1904-1912. (1913 Estimated.)

(FROM THE UNITED STATES GEOLOGICAL SURVEY.)

PRODUCTS. METALLIC.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Products.
Pig iron (spot value) long tons.....	16,497,033	\$233,025,000	22,992,380	\$382,450,000	25,307,191	\$505,700,000	Pig iron.
Silver, commercial value, troy ounces...	57,682,800	33,456,000	56,101,600	34,221,976	56,517,900	38,256,400	Silver.
Gold, coining value, troy ounces.....	3,892,480	80,464,700	4,265,742	88,180,700	4,565,333	94,373,800	Gold.
Copper, value at New York City, pounds	812,537,267	105,629,845	901,907,843	139,795,716	917,805,682	177,595,888	Copper.
Lead, value at New York City, short tons	307,000	26,402,000	302,000	28,690,000	350,153	39,917,442	Lead.
Spelter, value at N. Y. City, short tons	186,702	18,670,200	203,849	24,054,182	199,694	24,362,668	Spelter.
Quicksilver, value at S. Francisco, flasks	34,570	1,503,795	30,451	1,103,120	26,238	958,634	Q'silver.
Aluminum, value at Pittsburgh, pounds	8,600,000	2,477,000	11,347,000	3,246,300	14,910,000	4,262,286	Aluminum.
Antimony, value at S. F'cisco, short tons	3,057	505,524	3,240	705,787	1,766	602,949	Antimony.
Nickel, value at Philadelphia, pounds...	24,000	11,400	.....	.....	.....	35,600	Nickel.
Tin, pounds .....	.....	.....	.....	.....	.....	.....	Tin.
Platinum, value (crude) at New York City, troy ounces.....	200	4,160	318	5,320	1,439	45,189	Platinum.
Total value of metallic products.....	.....	\$502,149,624	.....	\$702,453,101	.....	\$886,110,856	.....

PRODUCTS. METALLIC.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Products.
Pig iron (spot value) long tons.....	25,781,361	\$529,958,000	15,936,018	\$254,321,000	25,795,471	\$419,175,000	Pig iron.
Silver, commercial value, troy ounces...	56,514,400	37,299,700	52,440,800	28,050,600	54,721,500	28,455,200	Silver.
Gold coining value, troy ounces.....	4,374,827	90,435,700	4,574,340	94,560,000	4,821,701	99,673,400	Gold.
Copper, value at New York City, pounds	868,996,491	173,799,300	942,570,721	124,419,335	1,092,951,624	142,083,711	Copper.
Lead, value at New York City, short tons	365,166	38,707,596	310,762	26,104,008	363,319	31,245,434	Lead.
Spelter, value at N. Y. City, short tons	223,745	26,401,910	190,749	17,930,406	230,225	24,864,300	Spelter.
Quicksilver, value at S. Francisco flasks	21,567	828,931	19,752	824,146	21,075	957,859	Q'silver.
Aluminum, value at Pittsburgh, pounds	17,211,039	4,926,948	11,152,000	2,434,600	34,210,000	6,575,000	Aluminum.
Antimony, value at S. F'cisco, short tons	2,022	622,046	13,629	1,264,771	12,896	1,231,019	Antim. Id.
Nickel, value at Philadelphia, pounds...	9,910	1,322,985	.....	.....	19,284,172	10,027,769	Nickel.
Tin, pounds .....	.....	33,285	.....	.....	.....	4,832	Tin.
Platinum, value (crude) at New York City, troy ounces.....	357	10,589	750	14,250	638	15,950	Platinum.
Total value of metallic products.....	.....	\$903,802,244	.....	\$549,923,116	.....	\$764,309,474	.....

PRODUCTS. METALLIC.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Products.
Pig iron (spot value) long tons.....	26,674,123	\$412,162,486	23,257,288	\$327,334,624	30,180,969	\$420,563,388	Pig iron.
Silver, commercial value, troy ounces...	57,137,900	30,854,500	60,399,400	32,615,700	63,766,800	39,197,500	Silver.
Gold, coining value, troy ounces.....	4,657,018	96,269,100	4,687,053	96,890,000	4,520,717	93,451,500	Gold.
Copper, value at New York City, pounds	1,080,159,509	137,180,257	1,097,232,749	137,154,092	1,243,268,720	205,139,338	Copper.
Lead, value at New York City, short tons	389,211	34,250,568	405,863	36,527,670	415,395	37,385,550	Lead.
Spelter, value at N. Y. City, short tons	252,479	27,267,732	271,621	30,964,794	323,907	44,699,166	Spelter.
Quicksilver, value at S. Francisco, flasks	20,601	958,153	21,256	977,989	25,064	1,053,941	Q'silver.
Aluminum, value at Pittsburgh, pounds. (h)	47,734,000	8,955,700	46,125,000	8,084,000	65,607,000	11,907,000	Aluminum.
Antimonial lead, short tons.....	14,069	1,338,090	14,078	1,380,556	13,552	1,311,348	Antim. l'd.
Nickel, value at Philadelphia, pounds...	25,359,544	13,186,963	445	127,000	.....	.....	Nickel.
Tin, pounds .....	.....	23,447	.....	56,635	260,000	124,800	Tin.
Platinum, value (crude) at New York City, troy ounces.....	773	25,277	940	40,890	1,005	45,778	Platinum.
Total value of metallic products.....	.....	\$762,472,273	.....	\$680,531	.....	\$854,779,309	.....

PRODUCTS. METALLIC.	Quantity.	Total.	Value.	Per Unit.
Pig iron, long tons*	31,160,000	\$498,560,000		\$16.
Copper, pounds†	1,618,000,000	247,554,000		.153
Gold, ounces, fine†	4,271,921	88,301,023		\$20.67
Antimonial lead, Short tons.....	16,338	.....		.....
Lead, short tons†	466,843	41,082,184		.044
Spelter, short tons†	345,575	39,395,550		.056
Quicksilver, flasks*	21,000	829,000		\$39.50
Silver, ounces, fine†	67,601,111	40,864,871		.605
Nickel, pounds (a)	50,000,000	21,000,000		.42

(a) Smelted in the United States for metal, oxide and salts.

Figures for metals marked * from Engineering and Mining Journal.

Figures for metal marked † from United States Geological Survey.

(h) Consumption 1910-1911-1912.

Metal Prices, January 12, 1914

METAL PRICES.		Price per lb.
		Cents.
COPPER—PIG AND INGOT AND OLD COPPER.		
Duty Free. Manufactured 5 per centum.		
Lake, carload lots, nominal.....		15.25
Electrolytic, carload lots		14.75
Castings, carload lots		14.50
TIN—Duty Free.		
Straits of Malacca, carload lots.....		37.00
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets,		
25%. Pig lead, carload lots.....		4.10
SPELTER—Duty 15%. Sheets, 15%.		
Western, carload lots		5.30
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets,		
bars and rods, 3½c. per lb.		
Small lots, f. o. b. factory.....		23.00
100 lb. lots, f. o. b. factory.....		21.00
Ton lots, f. o. b. factory.....		19.00
ANTIMONY—Duty free.		
Cookson's cask lots, nominal.....		7.50
Hallett's cask lots		7.20
Hungarian grade		6.50
NICKEL—Duty Ingot, 10%. Sheet, strip and wire		
20% ad. valorem.		
Shot, Plaquettes, Ingots. Blocks according to		
quantity	40 to	.45
ELECTROLYTIC—3 cents per pound extra.		
MANGANESE METAL—Duty 10% .....		.90
MAGNESIUM METAL—Duty 25% ad valorem (100 lb.		
lots)		1.50
BISMUTH—Duty free		2.00
CADMIUM—Duty free .....		.90
CHROMIUM METAL—Duty free.....		.98
QUICKSILVER—Duty 10% .....		.53
		Price per oz.
GOLD—Duty free		\$20.67
PLATINUM—Duty free		43.50
SILVER—Government assay bars—Duty free.....		57¼

INGOT METALS.		Price per lb.
		Cents.
Silicon Copper, 10%.....according to quantity	27 to 32	
Silicon Copper, 20%.....	34 to 36	
Silicon Copper, 30% guaranteed	36 to 38	
Phosphor Copper, guaranteed 15%	21½ to 27½	
Phosphor Copper, guaranteed 10%	23 to 27	
Manganese Copper, 25%.....	25 to 29	
Phosphor Tin, guaranteed 5%	61 to 63	
Phosphor Tin, no guarantee..	42 to 45	
Brass Ingot, Yellow.....	10½ to 10½	
Brass Ingot, Red.....	12 to 14	
Bronze Ingot	12¾ to 13¾	
Manganese Bronze	18 to 19½	
Phosphor Bronze	20 to 23	
Casting Aluminum Alloys....	17 to 19	

PHOSPHORUS—Duty free.	
According to quantity.....	30 to 35

Dealers' Buying Prices.	OLD METALS.	Dealers' Selling Prices.
Cents per lb.		Cents per lb.
12.75 to 13.00	Heavy Cut Copper.....	14.00 to 14.25
12.50 to 12.75	Copper Wire	13.50 to 13.75
11.25 to 11.50	Light Copper	12.50 to 12.75
10.50 to 10.75	Heavy Mach. Comp.....	12.50 to 12.75
7.25 to 7.50	Heavy Brass	8.75 to 9.00
6.25 to 6.50	Light Brass	7.75 to 8.00
7.50 to 7.75	No. 1 Yellow Brass Turnings.....	8.00 to 8.50
9.50 to 10.00	No. 1 Comp. Turnings.....	10.75 to 11.00
3.50 to —	Heavy Lead	— to 3.90
3.75 to —	Zinc Scrap	4.15 to 4.25
5.50 to 6.50	Scrap Aluminum Turnings.....	7.00 to 8.00
11.50 to 12.00	Scrap Aluminum, cast, alloyed....	13.00 to 14.00
13.00 to 14.00	Scrap Aluminum, sheet (new).....	14.00 to 15.00
23.00 to 24.00	No. 1 Pewter.....	25.00 to 26.00
20.00 to 23.00	Old Nickel	20.00 to 23.00

PRICES OF SHEET COPPER.

BASE PRICE, 20½ Cents per Lb. Net.											
SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.	
Width.	LENGTH.	Extras in Cents per Pound for Size and Weights Other than Base.									
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½	
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7		
	Longer than 120 ins.	"	"	1	1½						
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8	
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4				
	Longer than 120 inches.	"	1	2	3						
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9	
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9				
	Longer than 120 inches.	"	1	3	6						
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11		
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6						
	Longer than 120 inches.	1	2	4	8						
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8						
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10						
	Longer than 120 inches.	1	3	8							
	Not longer than 96 inches.	1	3	6							
Wider than 72 ins. but not wider than 108 ins.	Longer than 96 inches. Not longer than 120 inches.	2	4	7							
	Longer than 120 inches.	3	5	9							
	Not longer than 96 inches.	2	4	7							
	Longer than 120 inches.	3	5	9							
Wider than 108 ins. but not wider than 120 ins.	Not longer than 120 inches.	4	6								

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from.....	8c.
CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from.....	5c.
COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices.....	1c.
COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices.....	2c.
COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.	
ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper.....	1c.
ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper.....	2c.
For Polishing both sides, double the above price.	
The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.	
COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.	
ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper	1c.

ZINC—Duty, sheet, 15%.	Cents per lb.
Carload lots, standard sizes and gauges, at mill.....	7.50 less 8%
Casks, jobbers' prices	8c.
Open casks, jobbers' prices	8½c.

Metal Prices, January 12, 1914

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect January 1, 1914, and until further notice.

To customers who buy over 5,000 lbs. per year.			
	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	\$0.14 1/2	\$0.16 1/2	\$0.18
Wire	.14 1/2	.16 1/2	.18
Rod	.14 1/2	.17 1/2	.19
Brazed tubing	.19 1/2	—	.22 1/2
Open seam tubing	.19 1/2	—	.22 1/2
Angles and channels, plain	.19 1/2	—	.22 1/2

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	1/2c. per lb. net advance
—Best spring, drawing and spinning brass	1 1/2c. " " " "
Wire—Extra spring and brazing wire	1/2c. " " " "
—Best spring and brazing wire	1c. " " " "

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	\$0.16	\$0.17 1/2	\$0.19 1/2
Wire	.15 1/2	.17 1/2	.19 1/2
Rod	.15 1/2	.18 1/2	.20 1/2
Brazed tubing	.20 1/2	—	.24
Open seam tubing	.20 1/2	—	.24
Angles and channels, plain	.20 1/2	—	.24

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	1/2c. per lb. net advance
—Best spring, drawing and spinning brass	1 1/2c. " " " "
Wire—Extra spring and brazing wire	1/2c. " " " "
—Best spring and brazing wire	1c. " " " "

BARE COPPER WIRE—CARLOAD LOTS.

16c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	20 1/2c. per lb. base
100 lbs. to 300 lbs. in one order	21c. " " "
Less than 100 lbs. in one order	22 1/2c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1 1/4 to 3 1/2 O. D. Nos. 4 to 13 Stubs' Gauge, 19 1/2c. per lb. Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.													
1/4	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6
27 1/2	20 1/2	21 1/2	20 1/2	19 1/2	19 1/2	19 1/2	19 1/2	19 1/2	20 1/2	21 1/2	23 1/2	25 1/2	26 1/2

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet—	
	Brass.	Bronze.
1/2 inch	8	9
3/4 inch	10	11
1 inch	12	13
1 1/4 inch	14	15
1 1/2 inch	18	20
2 inch	22	24
2 1/2 inch	25	27
3 inch	32	35
3 1/2 inch	45	48
4 inch	50	50

Discount 50—55%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	18c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	15c.	" "
Rectangular sheets other than Sheathing	17 1/2c.	" "
Rod	15c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 24 1/2c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin.—Not over 18 in. in width or thinner than No. 20 B. & S. Gauge, 5c. above price of pig tin in same quantity. Prices of greater width and thinner gauges on request.
No. 1 Britannia Metal.—Not over 18 in. in width or thinner than No. 20 B. & S. Gauge, 4c. above price of pig tin in same quantity. Prices of greater width and thinner gauges on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	500 lbs.	50 lbs.	Less than 50 lbs.
20 and heavier	3-30	30c.	34c.	36c.	38c.
21 to 24 inclusive	3-36	32c.	35c.	37c.	39c.
	30-48	33c.	37c.	39c.	41c.
25 and 26	48-60	39c.	40c.	42c.	44c.
	3-30	33c.	36c.	38c.	40c.
27	30-48	35c.	38c.	40c.	42c.
	3-30	36c.	37c.	39c.	41c.
28	30-48	39c.	40c.	42c.	44c.
	3-30	37c.	38c.	40c.	42c.
29	30-48	40c.	41c.	43c.	45c.
	3-30	38c.	39c.	41c.	43c.
30	30-48	42c.	43c.	45c.	47c.
	3-30	39c.	40c.	42c.	44c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. Charges made for boxing. F. O. B. MILL.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 24 Cents per Pound.

Stub's Gauge.	Inches.	1/2 in.	5-16 in.	3/8 in.	1/2 in.	5/8 in.	3/4 in.	1 in.	1 1/4 in.	1 1/2 in.	2 in.	2 1/2 in.	3 in.	3 1/2 in.	4 in.	4 1/2 in.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	19	9	15
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..
16.	.065.	..	..	..	..	..	..	..	27	26	22	22	20	20	20	26
18.	.049.	..	..	..	..	..	..	..	32	29	28	27	24	25	25	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	..	44	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter.	000 to No.	No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
B. & S. G'ge	No. 10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	
Price per lb.	..	33	33 1/2	33 1/2	34	34 1/2	35	35 1/2	36	37	38	39	44	47

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	\$0.52	16	\$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent. to No. 19, B. & S. Gauge, inclusive	\$0.60
6 " " " " " "	.70
9 " " " " " "	.85
12 " " " " " "	1.00
15 " " " " " "	1.15
16 " " " " " "	1.20
18 " " " " " "	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazen Brass Tube.
For cutting to special lengths add same advances as for Brazen Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2 1/2c. to 3 1/2c. above the price of bullion.